

THE VALUE OF COTTON-SEED PRODUCTS IN THE FEEDING OF FARM ANIMALS

AS A HUMAN FOOD AND AS A FERTILIZER

Feed Units

FEEDING VALUES of the chief nutrients Protein, Fat and Carbohydrates (as determined by the leading investigators) are reduced to common terms and made into a direct ratio. One pound of Protein is considered of the same value as two and one-half pounds of Carbohydrates, and one pound of **FAT** is equal to two and one-quarter pounds of Carbohydrates.

To find the **FEED UNITS**, multiply the Protein content by 2.5 and the Fat content by 2.25 and add these to the Carbohydrate content.

Nutritive Ratio

To find the Nutritive Ratio, divide total digestible Protein into the sum of the total digestible Carbohydrates, plus the total digestible Fat, multiplied by 2.25.

Cost Per Feed Unit

Illustrations below are based on Bulletin No. 11 of United States Department of Agriculture.

COMPARATIVE PERCENTAGE OF FEED UNITS IN

COTTON-SEED MEAL.....57.76 Per Cent
One-half the weight is nourishment.

WHEAT BRAN 19.40 Per Cent
One-fifth only is nourishing.

CORN MEAL.....13.34 Per Cent
One-eighth only is nourishment.

COMPARATIVE COST PER FEED UNIT

CORN MEAL at \$1.00 per 100 pounds,
6 1-4 cents per feed unit.

WHEAT BRAN at \$1.25 per 100 pounds,
6 1-4 cents per feed unit.

COTTON-SEED MEAL, at \$1.50 per hundred pounds,
3 cents per feed unit.

Cotton-Seed Meal is the Most Concentrated and Cheapest Feed to be Had.

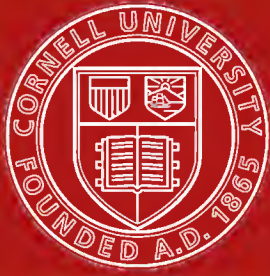
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The value of cotton-seed products in the



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AS A HUMAN FOOD AND AS A FERTILIZER



WITH
SOME GENERAL NOTES ON THE
COTTON-SEED MANUFACTURING
INDUSTRY

PUBLISHED BY THE
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JO W. ALLISON, CHAIRMAN
DALLAS, TEXAS

1913

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The Cotton Plant



THE COTTON PLANT has made possible ragless and strawless paper, cocoonless silk, creamless ice cream, cowless butter and hogless lard. The South already clothes the world; she is also able to feed it. We do not propose it; we do not want it, but if necessary, we are entirely able, with plenty for ourselves and much to spare, to make a cornless, a wheatless and a hogless South, and I want to go on record with this prediction, that middle-aged men and women now living, will see the time when COTTON SEED FLOUR will take higher place on the tables of all the world than the less nutritive and less palatable Corn and Wheaten products.

Jo W. Allison.

WHAT a royal plant it is! The world waits in attendance on its growth. The showers that fall whispering on its leaves are heard around the earth. The sun that shines upon it is tempered by the prayers of all the people. The frosts that chill it and the dews that descend from the stars are noted, and the trespass of a little worm upon its green leaf means more to England and to English homes than the advance of a Russian army upon her Asian frontier. It is gold from the time it puts forth its tiniest shoot. Its foliage decks the sombre earth in emerald sheen. Its blossoms reflect the brilliant hues of sunset skies in Southern climes and put to shame the loveliest rose; and when loosing its snowy fleeces to the sun, it floats a banner that glorifies the field of the humble farmer, that man is marshalled under a flag that will compel the allegiance of the world and wring a tribute from every nation on the earth. Its Fibre is current in every bank in the world. Its Oil adds luxury to lordly banquets in noble halls and brings comfort to lowly homes in every clime. Its Flour gives to man a food richer in health-producing value than any the earth has ever known, and a curative agent long sought and found in nothing else. Its Meal is food for every beast that bows to do man's labor, from Norway's frozen peaks to Africa's parched plains.

It is a heritage that God gave to this people when He arched the skies, 'stablished our mountains, girded us about with oceans, loosed the breeze, tempered the sunshine and measured the rain. Ours and our children's forever and forever, and no princelier talent ever came from His Omnipotent hand to mortal stewardship.



The Cotton Trade.

Where sleeps the poet who shall fitly sing
The source wherefrom doth spring
That mighty commerce, which confined
To the mean channel of no selfish mart,
Goes out to every shore
Of this broad earth and throngs the sea with ships
That bear no thunder; hushes hungry lips
In alien lands:
Joins with delicate web remotest strands;
And gladdening rich and poor,
Doth gild Parisian domes,
Or feed the cottage smoke of English homes,
And only bounds its blessings by mankind.

Henry Timrod.



Cotton Fields.

Yonder bird
Which floats as if at rest,
In those blue tracts above the thunder, where
No vapors cloud the stainless air,
And never sound is heard,
Unless at such rare time,
When from the City of the Blest
Rings down some golden chime,
Sees not from his high place
So vast a cirque of summer space,
As widens round me in one mighty field,
Which rimmed by seas and sands, doth hail its
 earliest daylight in the beams
Of gray Atlantic dawns;
And broad as realms made up of many lands,
Is lost afar
Behind the crimson hills and purple lawns
Of sunset, among plains which roll their streams
Against the Evening Star!
And lo!
To the remotest point of sight,
Although I gaze upon no waste of snow,
The endless field is white,
And the whole landscape glows,
For many a shining league away,
With such accumulated light,
As Polar lands would flash beneath a tropic day.

Henry Timrod.



Chapter I.

Cotton

Cotton is famous in history and in song. It has been called King, and Queen, and Princess.

Its fibre makes clothing, paper, books, buckets, pans, car wheels, boxes, blankets, beds. Its blossoms supply the nectar to bees for the manufacture of the best quality of honey known to man. It is the countryman's flower garden upon which he rests his tired eyes. Its leaves and stalks feed the soil. Its seed—a newly discovered fountain of wealth—food for all animal creation. Its seed furnishes meal for live stock, bread for man, and oil for salads, cakes, pastry, butter, lard, as well as for soap and paints. Cotton not only clothes the world, but feeds it and cleans it.

And yet this miraculous plant, this eighth wonder of the world, is less appreciated at home than abroad. Think of the *trader* in cotton-seed products spending money advertising their good qualities—increasing the consumption by increasing the demand and increasing the value of the raw material by both—and the *producer* standing with his hands in his pockets skeptically looking on! The agricultural sin of the cotton growing countries today is the exportation of cotton-seed meal, cake and oil! There is not enough for home consumption. The seed alone from an acre of cotton is worth as much as all the corn that could be produced upon that acre. But it does not sell for as much because the producer does not know the value of each.

COTTON

By Katie Daffan

Have you seen her? Princess Cotton?
In the South's own, sunny land?
Spreading o'er her fair dominions,
Down into the white beach sand?

Look upon her golden glory
In this land, by heaven crowned!
See her bursting bolls, like snowdrift,
Sound her praise the world around!



A familiar gin scene in cotton countries where the cotton fibre called lint is separated from the seed and baled for shipment to cotton factories.



Another gin scene in cotton countries. The lint is baled and shipped to cotton factories and the seed is shipped to oil mills where the hulls, meal, and oil are separated for food stuffs and feeding stuffs.



The Composition of the Animal Body.

The animal body is composed of a great variety of substances which may be classified into *water, ash, fat, protein* and the *contents of the stomach*. The percentage of each of these substances, as determined by the U. S. Department of Agriculture, Farmers' Bulletin No. 346, is as follows:

Percentage Composition of Live Animals.

	Ox			Fat Calf	Sheep					Swine	
	Well fed	Half fed	Fat		Lean	Well fed	Half fat	Fat	Very fat	Well fed	Fat
	%	%	%	%	%	%	%	%	%	%	%
Water	54.3	50.2	43.6	60.1	56.6	53.7	50.7	44.8	39.0	53.9	42.0
Ash	4.8	4.4	3.9	4.5	3.4	3.3	3.2	2.9	2.8	2.7	1.8
Fat	7.1	14.9	26.8	13.1	8.6	13.2	18.3	28.1	37.2	22.5	40.2
Protein	15.8	15.5	13.7	15.3	15.4	14.8	13.8	12.2	11.0	13.9	11.0
Contents of stomach and intestines	18.0	15.0	12.0	7.0	16.0	15.0	14.0	12.0	10.0	7.0	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

As the animal fattens the *protein, ash, and water* of the body do not increase of course as fast as fat. The percentages of these, the amounts compared to the increased weight of the animal fattened as fattening progresses are smaller, therefore. That is, the water, ash, and protein do not increase in quantity as fast as the fat, during the fattening process.

There is a small amount of *glycogen*, which is a *carbohydrate*, stored up in the liver, muscles, and a few other organs of the body, but not in a sufficiently large amount to be estimated in the above table.

Fat is a reserve material of the body, the location of which is well known. It furnishes *heat and energy* to the animal for keeping up the vital processes in time of famine.

The *water, ash and protein*, according to the above bulletin, constitute the essential working parts of the body. The bones, constituting the framework of the body; the ligaments, muscles and tendons which bind together and move the bones; the skin and hair, or wool, which cover and protect the

body; the internal organs of circulation, respiration, digestion, excretion, and reproduction; the brain and nerves—in short, the whole mechanism of the body—can be regarded as being composed substantially of these three classes of substances.

The Composition of Feeding Stuff.

The food that supplies the animal organism must necessarily contain those ingredients which the animal can utilize for the production of the elemental constituents of the body before mentioned, because these are constantly being worn out in maintaining the life of the animal. And it has been found by analysis that the animal's food is composed of substances of the same general classification as those of which the body is composed. According to the U. S. Department of Agriculture, Farmers' Bulletin No. 22, these substances are described as follows:

Ash.

"Ash is what is left when the combustible part of a feeding stuff is burned away. It consists chiefly of lime, magnesia, potash, soda, iron, chlorine, and carbonic, sulphuric, and phosphoric acids, and is used largely in making bones. From the ash constituents of the food the animal selects these which it needs and the rest is voided in the manure. As a general rule rations composed of a variety of nutritious foods contain sufficient ash to supply the requirements of the body.

Fat.

"Fat, or the materials dissolved from a feeding stuff by ether, includes, besides real fats, wax, the green coloring matter of plants, etc. For this reason the ether extract is usually designated **CRUDE fat**. The fat of food is either stored up in the body as *fat*, or burned (oxidized in the body) to furnish heat and energy.

Carbohydrates.

"Carbohydrates are usually divided into two groups, *nitrogen-free extract*, including starch, sugar, gums, and the like, and cellulose or *fiber*, the essential constituent of the walls of vegetable cells. Cotton fiber and wood pulp are nearly pure cellulose. Coarse fodders, like hay and straw, contain a large proportion of fiber, while most grains contain little fiber, but are rich in starch, sugar, etc. (nitrogen-free extract). The carbohydrates form the largest part of all vegetable foods. They are not permanently stored up as such in the animal body, but are either *stored up as fat* or burned in the system to *produce heat and energy*. They are one of the principal sources of animal fat.



A train load of tank cars of cotton-seed oil which is taking the place of hog lard for all cooking and edible purposes for which lard is used.

Protein.

"Protein (or nitrogenous materials) is the name of a group of materials containing nitrogen. All other constituents of feeding stuffs, the ash, fat, and carbohydrates are non-nitrogenous or free from nitrogen. Protein materials are often designated as flesh formers, because they furnish the materials for the *lean flesh*; but they also enter largely into the composition of *blood, skin, muscles, tendons, nerves, hair, horns, wool*, and the *casein and albumen of milk*, etc. *For the formation of these materials protein is absolutely indispensable.* No substances free from nitrogen can be worked over into protein, or fill the place of protein. It is, then, absolutely necessary for an animal to be provided with certain amount of protein in order to grow or maintain existence. Under certain conditions it is believed protein may be a source of fat in the body; and finally it may be burned, like the carbohydrates and fat, yielding heat and energy.

"The sources of *heat and energy* in the animal, then, are the protein, fat, and carbohydrates of the food and the fat and protein of the body, for the fat and protein of the body may be burned like that in the food. The value of the fat for producing heat is nearly two and a half times that of carbohydrates or protein. The sources of fat in the body are the *fat, carbohydrates and, probably, the protein* of the food; and the exclusive source of protein in the body is the protein in the food."

It cannot be too strongly emphasized that *protein produces heat, energy and fat* in the animal body just as the fats and carbohydrates do. In addition to this function, it does what fat and carbohydrates cannot do, viz., *it produces muscle, blood, skin, tendons, nerves, hair, horns, wool*, and the *casein and albumen of milk*. Protein makes the animal frame,—that which counts in so many ways. Henry C. Sherman, Professor in Columbia University, in his *Chemistry on Food and Nutrition*, says:

"Whatever the mechanism of their assimilation the absorbed proteins soon become available for the nutrition of the body, and among other functions they, like the carbohydrates and fats, may be burned as fuel for muscular work. Pfluger proved that protein may serve as a source of muscular energy by feeding a dog for seven months exclusively upon meat practically free from fat and carbohydrate, and requiring it throughout the experiment to do considerable amounts of work, the energy for which must in this particular case have been derived largely from protein consumed.

"New experiments in Voit's laboratory by Cremer appear, however, to establish the formation of body fat from protein food beyond reasonable doubt.

"The evidence of formation of milk fat in part from protein, while perhaps not amounting to a mathematical demonstration, is still very strong.

"For practical purposes the outcome of the controversy as to the direct formation of fat from protein is of minor importance, since there is already abundant experimental evidence of the production of carbohydrate from protein and the transformation of carbohydrate into fat, so that it is evident that protein food can indirectly, if not directly, contribute to the formation of fat in the body."

Average Composition of Feeding Stuffs.

Feed	Percentage Composition							Per Cent of Digestible Matter			
	Dry Matter	Water	Ash	Protein	(Nitrogen-Free Extract)	Crude Fibre	Fat (Ether extract)	Protein	Carbohydrates	Crude Fibre	Fat
Oats (Grain)	89.0	11.0	3.0	11.8	59.7	9.5	5.0	9.3	44.8	2.8	3.5
Corn (Grain)	89.4	10.6	1.5	10.3	70.4	2.2	5.0	7.8	65.5	1.3	4.3
Corn Meal	85.0	15.0	1.4	9.2	68.7	1.9	3.8	5.5	63.9	0.6	3.5
Corn and Cob Meal	84.9	15.1	1.5	8.5	64.8	6.6	3.5	4.4	57.0	3.0	2.9
Hominy Chops	88.9	11.1	2.5	9.8	64.5	3.8	8.3	7.5	55.0	....	6.8
Wheat (Grain)	89.5	10.5	1.8	11.9	71.9	1.8	2.1	10.2	69.0	....	1.7
Wheat Bran	88.1	11.9	5.8	15.4	53.9	9.0	4.0	12.1	37.2	2.0	2.7
Wheat Middlings	87.9	12.1	3.3	15.6	60.4	4.6	4.0	12.8	51.3	1.7	3.4
Rye (Grain)	88.4	11.6	1.9	10.6	72.5	1.7	1.7	9.9	67.6	....	1.1
Cotton Seed	89.7	10.3	3.5	18.4	24.7	23.2	19.9	12.5	12.3	17.6	17.3
Cotton Seed (Roasted)	93.9	6.1	5.5	16.8	23.5	20.4	27.7	7.9	12.0	13.5	19.9
Cotton Seed Meal (Choice)	91.8	8.2	7.2	42.3	23.6	5.6	13.1	37.2	15.1	1.8	12.2
Rice (Rough)	89.1	10.9	5.5	7.4	64.3	9.3	2.6	....	....	....	....
Rice (Clean)	87.2	12.8	0.7	7.5	78.1	0.5	0.4	....	....	....	....
Rice Bran, 15 per cent hulls	90.1	9.9	11.3	9.9	44.5	14.5	9.9	6.4	34.8	1.9	5.4
Rice Polish	88.5	11.5	3.5	11.1	64.3	3.8	5.8	7.3	59.6	0.8	4.3
Rice Meal (Pure Bran)	91.4	8.6	8.9	13.3	49.8	8.7	10.7	8.6	38.9	1.1	5.9
Buckwheat	87.4	12.6	2.7	10.0	64.5	8.7	2.2	7.7	49.0	....	1.8
Cane Molasses (Blackstrap)	77.6	22.4	9.3	2.4	65.9	....	....	....	65.9	....	....
Beet Molasses	79.2	20.8	10.6	9.1	59.5	....	....	....	59.5	....	....
Skimmed Milk (Separator)	9.4	90.6	0.7	3.1	5.3	....	0.3	2.9	5.2	....	0.3
Skimmed Milk (Gravity)	9.6	90.4	0.7	3.3	4.7	....	0.9	3.1	4.7	....	0.8
Buttermilk	9.9	90.1	0.7	4.0	4.0	....	1.1	3.9	4.0	....	1.1
Oat Hay (cut in milk)	85.0	15.0	5.2	9.3	39.0	29.2	2.3	5.0	20.3	12.7	1.4
Oat Straw	90.8	9.2	5.1	4.0	42.4	37.0	2.3	1.2	18.7	20.0	0.8
Corn Fodder (leaves)	91.1	8.9	9.7	11.8	41.5	24.7	3.3	5.3	26.3	17.1	2.0
Corn Fodder (whole plant)	67.8	32.2	4.3	4.8	37.2	20.2	1.3	2.6	23.6	13.8	0.9
Corn Stover (whole plant, except ears)	77.2	22.8	4.9	5.5	39.9	25.6	1.3	2.8	25.3	17.0	0.7
Corn Shucks	91.9	8.1	3.4	3.3	51.6	32.8	0.9	1.0	38.6	26.1	0.3
Wheat Straw	90.4	9.6	4.2	3.4	43.4	38.1	1.3	0.4	16.5	19.8	0.4
Rye Straw	92.9	7.1	3.2	3.0	46.6	38.9	1.2	0.6	17.2	23.3	0.4
Rice Straw	88.0	12.0	7.8	5.9	33.7	38.6	2.1	2.7	10.8	22.0	1.0
Cotton Seed Hulls	88.9	11.1	2.8	4.2	33.4	46.3	2.2	0.25	11.4	21.8	1.7
Cow Pea Hay	88.1	11.9	8.4	14.4	41.2	21.5	2.5	9.30	29.1	9.2	1.2
Alfalfa Hay	91.6	8.4	7.4	14.3	42.7	25.0	2.2	10.60	28.2	10.7	0.9
Soja Bean Hay	88.7	11.3	7.2	15.4	38.6	22.3	5.2	10.90	26.6	13.6	1.5
Vetch Hay	88.7	11.3	7.9	17.0	36.1	25.4	2.3	12.90	23.8	13.7	1.4
Peanut Vine Hay (without nuts)	92.4	7.6	10.8	10.7	42.7	23.6	4.6	6.70	29.9	12.3	3.0
Crimson Clover Hay	90.4	9.6	8.6	15.2	36.6	27.2	2.8	10.50	22.7	12.2	1.2
Red Clover Hay	84.7	15.3	6.2	12.3	38.1	24.8	3.3	7.60	26.3	12.1	2.0
Lespedeza Hay	89.7	10.3	4.1	11.7	43.8	26.5	3.6	7.6	31.1	11.1	1.8
Crab Grass Hay	89.7	10.3	7.3	6.9	41.0	32.9	1.6	2.2	21.6	21.2	0.6
Orchard Grass Hay	90.1	9.9	6.0	8.1	41.0	32.4	2.6	4.9	22.5	19.8	1.4
Timothy Hay	86.8	13.2	4.4	5.9	45.0	29.0	2.5	2.8	28.3	15.1	1.4
Bermuda Hay	89.4	10.6	6.4	10.2	48.3	22.4	2.2	4.6	26.1	13.0	0.9
Kentucky Blue Grass Hay	78.8	21.2	6.3	7.8	37.8	23.0	3.9	4.8	37.3	....	2.0
Millet Hay (Cat Tail)	89.5	10.5	10.2	9.9	36.6	30.8	2.0	6.2	21.6	20.5	0.9
Johnson Grass Hay	88.8	10.2	6.1	7.2	45.9	28.5	2.1	3.2	24.8	16.5	0.8
Corn Silage	20.9	79.1	1.4	1.7	11.0	6.0	0.8	0.9	7.6	3.7	0.7
Sorghum Silage	23.9	76.1	1.1	0.8	15.3	6.4	0.3	0.6	15.0	....	0.2
Soja Bean Silage	25.8	74.2	2.8	4.1	6.9	9.7	2.2	2.7	3.9	4.7	1.3
Cow Pea Silage	20.7	79.3	2.9	2.7	7.6	6.0	1.5	1.5	5.5	3.1	0.9
Sorghum (Green)	20.6	79.4	1.1	1.3	11.6	6.1	0.5	0.6	8.6	3.6	0.4
Corn (Green)	20.7	79.3	1.2	1.8	12.2	5.0	0.5	0.9	9.0	3.0	0.3
Alfalfa (Green)	28.2	71.8	2.7	4.8	12.3	7.4	1.0	3.9	9.3	3.3	0.5
Cow Pea (Green)	16.4	83.6	1.7	2.4	7.1	4.8	0.4	1.8	6.0	2.7	0.2
Lespedeza (Green)	30.0	....	....	2.7	14.4	....	0.6	2.7	14.4	....	0.6

} La. Station.

Halligan, La., Station.

Approximate.

Approximate.

Average Composition of Feeding Stuff—Continued

Feed	Percentage Composition							Per Cent of Digestible Matter			
	Dry Matter	Water	Ash	Protein	(Nitrogen-Free Extract)	Crude Fibre	Fat (Ether extract)	Protein	Carbohydrates	Crude Fibre	Fat
Oats (in bloom).....	37.8	62.2	2.5	3.4	19.3	11.2	1.4	2.5	12.1	6.7	1.0
Rye (Green)	23.4	76.6	1.8	2.6	6.8	11.6	0.6	2.0	4.8	9.3	0.4
Cabbage	9.5	90.5	1.4	2.3	3.9	1.5	0.4	1.8	*8.2	....	0.4
Rutabagas	11.4	88.6	1.2	1.2	7.5	1.3	0.2	1.0	7.1	1.0	0.2
Carrots	11.4	88.6	1.0	1.1	7.6	1.3	0.4	0.8	*7.8	....	0.2
Mangel Wurtzel	9.1	90.9	1.1	1.4	5.5	0.9	0.2	1.1	5.0	0.4	0.1
Rape	15.5	84.5	2.0	2.2	8.3	2.5	0.5	1.5	8.1	....	0.2
Potatoes (Irish)	21.1	78.9	1.0	2.1	17.3	0.6	0.1	0.9	*16.3	....	0.1
Potatoes (Sweet)	28.9	71.1	1.0	1.5	24.7	1.3	0.4	0.9	*22.2	....	0.3
Brewers' Grains (wet).....	24.3	75.7	1.0	5.4	12.5	3.8	1.6	3.9	7.7	1.5	1.4
Brewers' Grains (dried).....	91.8	8.2	3.6	19.9	51.7	11.0	5.6	15.7	30.0	6.0	5.1
Peanut Meal	89.3	10.7	4.9	47.6	23.7	5.1	8.0	42.9	*22.8	....	6.9

* Combined Nitrogen-Free Extract and Fibre.



Explanation of Terms Used in Literature on Feeding.

THE DIGESTIVE COEFFICIENT or *digestibility* of *food* is the per cent. of protein, fat or carbohydrates (fiber and nitrogen-free extract) that is digested and utilized by an animal. The rest is voided as feces. For example:

	Protein	AVERAGE		Fat
		Fiber	Carbohydrates Nitrogen-free Extract	
Cotton-seed meal contains.....	42.3%	5.6%	23.6%	13.1%
Corn meal contains.....	9.2%	1.9%	68.7%	3.8%

Eighty-eight per cent. of the protein of cotton-seed meal is digested and utilized by the animal. 88% then is the *digestive coefficient* of the *protein* of *cotton-seed meal*.

Sixty-seven and nine-tenths per cent., or in round numbers, 68% of the protein of corn is digested and utilized by the animal. Hence 68% is the *digestive coefficient* of the *protein* of *corn meal*.

Cotton-seed meal not only contains nearly five times as much protein as corn, but 20% more of the protein of cotton-seed meal is digested than the protein of corn meal.

NUTRITIVE RATIO is the ratio of the digestible protein of a feed to the combined digestible fat and digestible carbohydrates, after multiplying the fat by 2¼. Fat is 2¼ times more valuable than carbohydrates as a *heat* and *energy* producer. For example, if all the food nutrients were digestible in the above table, the fat of the cotton-seed meal (13.1%) multiplied by 2¼ equals 29.4

$$29.4 + 5.6 + 23.6 = 58.6$$

58.6 ÷ 42.3 protein = about 1.3 which would be the *nutritive ratio* of *cotton-seed meal*.

Similarly, the nutritive ration of corn meal would be 8.6. These ratios are sometimes written 1 to 1.3 and 1 to 8.6.

A BALANCED RATION is a ration made up of feeds whose *nutritive ratio* is about 1 to 6, and containing a sufficient volume of feeding material for the animal according to the particular species fed. That is, the ratio of the total digestible protein to the combined digestible fats and digestible carbohydrates as explained above. On other pages will be found tables showing the *composition*, the *digestibility*, and the per cent. of the *digestible nutrients* of feeding stuffs.

HAMPSHIRE BOAR

at

Spring Lake Plantation.

He eats cotton-seed meal and hulls continuously, with Bermuda grass "on the side."



Digestive Coefficient.

Digestibility of Food.

Not all of the protein, fat or carbohydrates (fiber and nitrogen-free extract) of feeding stuffs is digested by the animal that eats it. The per cent. of each food element that can be digested and utilized by animals differs with the feed and with the nature of the animal that eats it. The following table shows the digestibility of a few common feeds:

	<i>Protein</i>	<i>Fiber</i>	<i>Nitrogen-Free Extract</i>	<i>Fat</i>
	<i>%</i>	<i>%</i>	<i>%</i>	<i>%</i>
Timothy	48.1	55.6	65.7	53.1
Pasture Grass	65.5	74.3	72.5	54.7
Barley	71.8	60.8	71.2	59.9
Dent Corn, all samples.....	59.7	60.2	73.7	74.1
Oats	71.8	52.8	62.6	69.2
Rye	79.4	79.2	70.1	74.5
Sorghum	46.8	59.	74.6	74.2
Alfalfa	81.	41.	72.	45.
Red Clover	67.	52.6	77.6	64.5
Cow Pea	75.6	59.6	80.6	59.4
Soy Bean	75.1	47.	73.2	54.1
Common Vetch	71.4	44.2	76.1	58.6
Johnson Grass	41.4	65.7	56.9	38.4
Orchard Grass	59.5	60.4	55.4	53.8
Mixed Grasses	58.5	59.7	58.7	48.5
Oat Hay	54.2	43.5	52.	61.9
Oat Straw	...	57.6	53.2	38.3
Wheat Straw (G)	23.	55.	39.	36.
Sorghum Fodder (pulled).....	60.8	70.4	64.5	46.7
Cow Pea Vine	64.8	42.	70.6	51.8
Peanut Vine	63.3	51.9	69.5	65.9
Hairy Vetch	82.3	61.1	72.9	70.3
Corn Meal	67.9	...	94.6	92.1
Corn-and-Cob Meal	55.6	45.7	87.6	84.1
Rye Meal	84.4	...	91.9	64.2
Pea Meal	83.2	25.7	93.6	54.5
Soy Bean Meal	91.1	71.2	76.3	85.7
Cotton-Seed, Raw	67.8	75.5	49.6	87.1
Cotton-Seed, Roasted	46.9	65.9	51.4	71.7
Cotton-Seed Meal	88.	55.	60.	93.
Dried Brewers' Grains.....	79.3	52.6	57.8	91.1
Gluten Feed	85.6	78.	89.2	84.4
Gluten Meal	88.2	...	89.8	94.4
Wheat Bran	77.8	28.6	69.4	68.
Wheat Bran and Shorts.....	75.8	18.3	64.3	45.
Linseed Meal	88.8	57.	77.6	88.6
Peanut Feed	70.6	11.7	49.1	89.7
Rice Meal	61.9	...	92.3	91.1
Cow's Milk	94.	...	98.	100.
Timothy Hay in Full Bloom, Well Cured	21.2	42.6	47.3	47.3
New Corn Product.....	67.5	54.6	46.9	59.8



A view of a packing plant where it shows how the cotton-seed oil is taken from the large tanks and packed in suitable containers for the retail trade. Year by year, this oil becomes more popular for all sorts of cooking purposes.



This shows how cotton-seed meal, hulls, and other feeding stuffs are mixed and sacked.

Chapter II.

Protein and Ash

Cost of Protein.

Regarding the feeding value of corn, the Virginia Agricultural Experiment Station, Bulletin 176, the following opinion is expressed:

"Corn forms the basis of almost all rations for farm-stock. Corn, however, has its limitations. To get greatest gains from corn it must be fed with other feeds richer in protein and ash. This is particularly true when corn is fed to young and growing stock. Corn is pre-eminently a fat and heatproducing food, which renders it quite unsuitable for constituting the entire grain ration for growing pigs. If used in this way, it results in the production of small boned, thin-muscled, and prematurely fat pigs, which are unprofitable to both feeder and packer, and entirely unsuitable for breeding."

This is a universal opinion among expert feeders. To obtain the best results, as the above bulletin points out, corn must be supplemented by a food rich in protein.

When we have to purchase a protein feeding stuff it will be important to determine which one is the cheapest and best adapted to the purpose for which it is to be used.



25 sacks of corn chops of 100 pounds each. In this 2500 pounds of corn chops there is 225 pounds of protein and 35 pounds of mineral matter.



Five sacks of cotton-seed meal of 100 pounds each. In this 500 pounds of cotton-seed meal there are 225 pounds of protein and 35 pounds of mineral matter.

Charles S. Phelps, in the February 8, 1913, issue of *The Country Gentleman*, Philadelphia, one of the oldest agricultural papers in the country, gives the following table of the cost of protein in some common articles of feed:

Cost of 1 Pound of Digestible Protein at Different Prices for Feeds.

	<i>Cost Per Ton</i>	<i>Percentage of Digestible Protein</i>	<i>Cost of 1 Lb. of Protein Cents</i>
Cotton-Seed Meal	\$36.	36.0	5.0
Cotton-Seed Meal	34.	36.0	4.7
Cotton-Seed Meal	32.	36.0	4.4
Linseed Meal at.....	40.	32.0	6.3
Linseed Meal at.....	36.	32.0	5.6
Gluten Feed at	30.	23.0	6.5
Gluten Feed at	28.	23.0	6.1
Buckwheat Middlings	26.	22.0	6.0
Buckwheat Middlings	24.	22.0	5.5
Dried Brewers' Grains	26.	15.5	8.4
Dried Brewers' Grains	24.	15.5	8.0
Wheat Bran	26.	12.5	10.0
Wheat Bran	24.	12.5	9.6
Corn Meal	32.	8.0	20.0
Oats—Ground	32.	9.5	17.0

"In this tabulation we have shown that cotton-seed meal, even at \$36 a ton, furnishes protein of the lowest cost per pound of any common feed in the markets. Linseed meal furnishes protein the next cheapest. We might add here that the old process and the new process linseed meals have about the same percentage of protein. Buckwheat middlings at from \$24 to \$26 a ton are cheaper than gluten feeds at \$20 a ton, but these two feeds furnish protein at the same cost when gluten feed sells for \$28 and buckwheat middlings for \$25. Brewers' grains are cheaper than bran at the same cost of each. Such feeds as cornmeal, hominy and oats furnish protein at the highest cost of all feeds, ranging from 17 to 20 cents a pound. Does this mean that these higher-priced feeds, as regards protein, should never be used? Certainly not, and especially when grown on the farm. They have much value for fattening, and a portion of the fattening foods is of importance in milk production. It does mean, however, that such feeds are relatively expensive to buy as a source of protein."

Here is a Northern farm journal telling the South that the protein of cotton-seed meal is the cheapest protein known. It reminds us that it took a Connecticut Yankee to show us how to get the oil out of cotton-seed, and to make cotton-seed meal, and to raise the price of cotton-seed from \$0.00 per ton to \$20.00 per ton.

There are many farmers raising cotton now who feed cotton-seed meal and use cotton-seed oil in the place of importing gluten feed and hog lard from his Northern neighbors. T. C. Westbrook, Waco, Texas, who cultivates about 5,000 acres of land and raises mules and horses, and thoroughbred Shetland ponies, hogs, goats, and sheep is one of the modern Southern farmers who fully appreciates the value of cotton-seed products. He feeds cotton-seed meal to hogs, as well as to other farm live stock, either by the Allison Method, or by mixing it with feeds rich in carbohydrates.

The Creeps in Cattle.

The Importance of Ash in Feeding Stuffs.



The cow on the left in this picture has a disease known as "The Creeps." She, with others affected with this disease, are penned and fed cotton-seed cake, which supplies both the food and the mineral matter necessary for renewing the starving condition of both the muscles and the bones.

The value of *protein* has been emphasized by every writer upon food values. *Carbohydrates* and *fats* have likewise received the attention they deserve.

But so far as the writer has been able to learn, after a diligent search through all the Agricultural Experiment Station Bulletins, both State and National, as well as through scientific books on farm live stock feeding, no one has ever emphasized the importance of ASH (the mineral matter of food) *lime, magnesia, potash, soda, iron, chlorin, carbonic, phosphoric, and sulphuric acids*—so

important in *bone* composition. It seems also that little emphasis has been placed upon the tremendous importance of the bones—the skeleton—and how to furnish them with material in a form adapted to the digestive apparatus of the animal. It is a well established fact that the minerals enumerated above cannot be assimilated by the tissues of an animal when fed to them directly as such, or as the mineral compounds which they form. They are assimilated from the food which the animal eats.

Because a feeding stuff contains a high percentage of mineral matter is no evidence that it supplies a sufficient amount of digestible mineral matter of all kinds necessary to the needs of an animal. This is clearly demonstrated in the case of grasses. Cattle that feed upon the grasses, exclusively, of the Southwestern part of the United States are subject to a disease known in this territory as *The Creeps*. "That is a *bone disease* in which there is a deficiency of *lime in the food*. And still it is a well known fact that cattle do not have "The Creeps" while feeding upon green grasses, although the green grasses have no more mineral matter in proportion to the dry matter of the grasses than the dry grasses have. In other words, the mineral matter of the green grasses is more available for the purposes of digestion than the mineral matter of the same grasses dry. An animal thrives better in all respects when it has "greens," either in the form of *living grass*, or in the form of "*canned vegetables*," as in the case of ensilage.

Now when it comes to the treatment of cattle with "The Creeps," what has been prescribed and what has been the experience of cattle men with these prescriptions? The following letter addressed to Dr. J. S. Abbott, Dairy and Food Commissioner of Texas, contains two prescriptions, viz.:

1. *Cotton-Seed Meal.*
2. *Portland Cement and Salt.*

The letter follows:

"The Agricultural & Mechanical College of Texas.
VETERINARY DEPT.

Dr. Mark Francis

Dr. R. P. Marsteller

Dr R. C. Dunn

College Station, Tex., Feb. 4, 1913.

Dr. J. S. Abbott,
Austin, Texas.

Dear Sir:

The disease of cattle called 'creeps' is due to a soreness of the bones as the result of a deficiency of lime in the food. It is quite common in the whole southwest and is especially prevalent among cows which are nursing calves. These animals become so depraved in appetite that they will chew the bones of animals which have died on the prairie in an attempt to secure lime. Cows which are nursing calves will recover in sixty days if the calf be weaned and the cow fed a reasonable amount of nourishing food. (Cotton-seed, cotton-seed meal or cake.) I believe the most practicable way to supply them the lime is to make a mixture of Portland cement and common salt, say, half and half, then add water and stir it so as to form a concrete; when it has been well mixed it might be shoveled into several boxes so as to set into a rock. In 24 hours the boxes may be hauled out into the pasture and distributed where the animals can have access to them. The salt will attract the animals to licking these rocks, and yet they cannot get enough at any time to cause illness. This is much easier than to try to put lime in their drinking water.

Very truly yours,

Mark Francis."

The following letter is also of interest and self-explanatory:

"UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY, Washington, D. C.

Address reply to 'Chief of
Bureau of Animal Industry,'
and refer to U-9, 203.

Feb. 14, 1913.

Dr. J. S. Abbott,
Austin, Texas.

Sir:

Referring to your letter of February 10th, the disease which you call creeps, technically designated osteomalacia, is caused by an insufficient supply of mineral ingredients in the food, probably phosphates of lime. It is apt to make its appearance when there has been no rain for a considerable time, and the grass does not contain a sufficient amount of lime salts, thus the animals fail to procure enough mineral matter. If it were possible to transfer affected animals to other pastures where there is more moisture, a marked improvement would be seen in those affected. It has been suggested that cotton-seed meal is one of the best feeds for cattle with this affection, as it is rich in lime salts.

Very respectfully,

Geo. W. Pope,
Acting Chief,
Quarantine Division."

The first prescription is for treatment of the disease, and the second is intended to prevent the disease. But the experience of cattle men indicates what has been considered for a long time a scientific fact, viz., that mineral matter can not be supplied as such directly to the animal tissues and become incorporated into them through the digestive processes.

The treatment of the disease, however, with cotton-seed meal or cake, as Dr. Francis says, is successfully done upon the range and it is the only effective treatment ever found by Rhome Shields, J. P. Anderson, T. J. Clegg, M. B. Pulliam, Willis Johnson, and many well known cattlemen of the San Angelo, Texas, Country.

Other feeding stuffs, less rich in ash, however, are also recommended as well as bone meal.

Just as *cotton-seed meal or cake* will cure "The Creeps," that is, supply the deficiency of mineral matter to the bones after it has been greatly reduced, just so will it supply the mineral matter necessary to the formation of bone in the young growing animal in a form that can be utilized by it in the development of a good substantial *frame*—which every breeder strives to obtain and which is obtained by selection and elimination over long periods of time.

Now the ratio of ash, or mineral matter, in cotton-seed meal to the dry matter of the meal is just about the same as it is in grasses, dry or green. But it can be utilized from cotton-seed meal when it can not from the grasses or from other feeding stuffs. Just what sort of compounds these minerals have formed in these feeding stuffs remains to be determined. Our Agricultural Experiment Stations might find it profitable to try to find out a physiological explanation of the above empirical knowledge.

Farmers' Bulletin No. 346, U. S. Department of Agriculture, issued Jan. 23, 1909, speaks of ash as follows:

"ASH—The ash supply has received less attention in the past than its importance deserves. In the ordinary operation of the bodily machinery its ash ingredients are being continually excreted and the food must supply ash sufficient in amount and of the right kinds to make good the loss, while the *growing animal* needs an additional supply for building up its new tissues. Fortunately, normally constituted rations appear to be rarely deficient in ash."



Farmers' Bulletin No. 22, U. S. Department of Agriculture, issued in 1901, thus speaks of the Ash, mineral matter, of corn:

"As a general rule rations composed of a variety of nutritious foods contain sufficient ash to supply the requirements of the body. Corn, however, is poor in ash, and when fed extensively to growing animals, like pigs, it may be necessary to add to it some ash material."

Bulletin No. 135 of the Agricultural Experiment Station of West Virginia, contains the following statement with reference to the importance of *ash* in a feeding ration:

"As compared with the composition of an egg, most of the grains commonly employed as poultry foods are too low in protein and ash.

"In feeding for egg production it is necessary not only to have the proportion of protein to carbohydrates approximately correct, but it is also essential to have the ash constituents of the ration sufficient in amount. There is nearly eight times as much ash in the dry substance of an egg as there is in corn or wheat, and this deficiency must be made good in some way."

There is nearly as much ash in cotton-seed meal as there is in the dry substance of an egg.

Corn contains about one-half as much ash as *oats*, and about one-fifth as much ash as cotton-seed meal or cake. Hence when one pound of cotton-seed meal or cake is substituted for five pounds of corn there is not only the same amount of *protein* fed, but the same amount of *ash* as well. The only deficiency, therefore, to be made up is the *carbohydrates* and possibly a little *fat*, depending upon the amount of fat in the cotton-seed meal or cake, which is three or four times that of corn.

Carbohydrates are plentiful generally any way, and cotton-seed meal is rich in digestible *fat* as well as in *digestible protein* and *digestible ash*.

"San Angelo, Texas, March 7, 1913.

Answering your inquiry of the 21st inst. in regard to my experience in feeding cattle with 'The Greeps,' I beg to say that the only remedy I have found that is entirely efficient is cotton-seed or cotton-seed meal or cake. It is quite an extreme case that this fails to cure. It is the only feed that I have ever found of any value for this range disease.

Yours truly,

Gerome W. Shield.



Twin calves from a cow, fed cotton-seed meal and hulls, both before and after calving.

"San Angelo, Texas, February 19, 1913.

*J. S. Abbott, Esq.,
Austin, Texas.*

Dear Sir:

Replying to your favor of the 17th inst. with reference to the treatment of range cattle for the creeps, especially with reference to feeding cotton-seed cake, I beg to say that my experience has been that when cattle have been taken up in the early stage of the creeps and fed on cottonseed cake or meal for from thirty to sixty days the disease entirely disappears. Of course, when cattle have been affected for a longer period it naturally requires a longer time to effect a cure, but in every instance where I have fed cattle affected with creeps on cotton-seed meal or cake I have effected a permanent cure.

Respectfully,

M. B. Pulliam."

"Replying to your favor of the 17th inst. beg to say that at different times I have come into possession of cattle that had been grazed in hilly pastures in dry seasons and which had the 'creeps.' It is my understanding that the 'creeps' amounts to a softening of the bone to such an extent that a very slight jar would break the bone; that this trouble is caused by a lack of Bicarbonate of Lime in the food the cattle eat. Any food that is rich in fat and protein is an effective remedy for the trouble. Cotton-seed is good, but cotton-seed meal and cake are better, in fact, cattle affected with the 'creeps' that are fed regularly a ration of either meal or cake rapidly recover and regain their normal healthy condition.

"Cows that are in bad shape and very poor should be started in on about one-half pound of cake per day and the feed gradually increased until they get three or four pounds of cake or meal in connection with the grass in pastures or roughness fed in lots."—T. J. Clegg, Concho Land Co., San Angelo, Texas.

Impotent Bulls

A most interesting experience has been that of T. J. Clegg, San Angelo, Texas, in feeding old bulls upon cotton-seed meal and hulls as told in the following letter. Whether there be a medicinal principle in cotton-seed meal and hulls, or not, the fact that it rejuvenates the old and decrepit bulls, cures "The Creeps" in cattle and "The Heaves" in horses and mules, certainly makes it an interesting subject for investigation by some one interested in trying to find a physiological explanation of this empirical knowledge. The writer has talked to Mr. Clegg upon the point in question and is satisfied that the cotton-seed products above mentioned have been the only effective feeding stuffs in producing the results which he described.

It may be that this result is obtained simply by virtue of the *protein* of the cotton-seed meal. It will be seen from another page that the digestive coefficient (digestibility) of cotton-seed meal is much higher than that of the *protein* of other farm products. It is 88% for cotton-seed meal and only 68% for corn meal. Besides, the former has nearly five times as much protein in it as corn meal.

The following letter is self-explanatory:

"San Angelo, Texas, Feb. 14th, 1913.

*Mr. J. S. Abbot,
Austin, Texas.*

Dear Sir:

Replying to your letter of inquiry of February 12th, 1913, relative to my experience in feeding Old Bulls and getting good service from them after they had once been counted as 'played out,' will say that I have been feeding cattle on rather an extensive scale with Cotton Seed Meal and Hulls ever since the industry has been developed to any great extent. At different times, I have bought old, run-down registered bulls that were not considered fit for service any more and put them in a feed lot on full feed and fed them as long as 120 days until they were finished fat on the meal and hulls, then, in the Spring, I have taken such bulls and turned them out with the cows and it is my experience, for that season, they would give as much or more service than they ever had before in any one season of their lives. I have never kept such bulls longer than one season for breeding purposes after they had been once fattened as above stated. Just so a bull has vitality enough to relish his feed and get fat, I am quite sure you will always find the results to be the same.

If you desire any further statement of my experience along this line, please call on me.

Very truly yours,

T. J. Clegg."

Wintering Range Cattle

THERE was a time in the good old days, so the old settlers say, when the prairie grass of Central and West Texas was waist high and therefore furnished an unlimited supply of winter as well as summer food for the native cattle of unknown breeding. But better days came for the pioneer who had the energy and courage to obey the Biblical injunction to "Subdue and have dominion" over the natural resources of this historic territory. The range was stocked with more and more cattle. More and more land became subject to cultivation. The old time cow man pushed on farther West hunting free open range. Today this is a thing of the past. As the grass became scarce, the cow man instinctively turned his attention to the problem of finding feed to supplement the grass, especially during drouths or during the hard winters with their cold wet "northers." Nature supplemented the grass feed with the mesquite tree and the cactus plant. Some years the mesquite tree furnishes a large yield of beans which are rich in food material. The cactus (prickly pear) is covered with spines that protect it when it is not needed. When it is needed, the spines are burned off so the cattle eat it with great relish. It is a roughness of great value when other feed is scarce. It contains about 70% water, 1.2% of protein, 6% fat, and 20% carbohydrates.

The mesquite beans are eaten up before the latter part of winter. The cactus contains very little nourishment and is troublesome to handle. Corn is too expensive to winter cattle on. Cotton-seed cake is cheap, a good appetizer, rich in food elements, especially *protein*, and easily handled. It has solved the problem of carrying range cattle through the winter.

The figure shows Mr. J. P. Anderson of San Angelo, Texas, standing with a bucket of cotton-seed cake in his hand calling his cows which may be seen coming toward him from away back in the mesquite brush. When they get close to him, he puts out a few handfuls close to the root of a bush to keep them from tramping it into the ground. It is too valuable to be used as a fertilizer. Each animal gets about 1 pound per day. After he feeds all the cattle that come to him, he drives off to another place on the ranch and feeds again.

These cattle are not the historic long horns. Their white faces and red bodies show their breeding. It is one indication of the intelligence of the owner. But the cotton-seed cake feeding on the range is the latest significance of the intelligence of the modern Westerner.

Now what is the value of such a method of feeding? Before the day of cake, the ranchman was lucky if he did not lose more than 10% of his herd in bad winters. If he loses 1% now, he thinks he has sustained too big a loss. But there is another and bigger consideration to this question than this. The cake, according to Mr. Anderson, T. J. Clegg, the Harris Bros.,

Rome Shields, Willis Johnson, and many other well known cattlemen of the San Angelo country, gives the cattle a *good appetite*. They actually eat coarser grasses and more of them than they would without the cake. They go through the winter in good shape, and when the spring grass comes on, "they grow right away from stuff that has not been fed this way," and fatten for market much earlier in the summer. That it pays to feed cotton-seed cake this way is the experience of every cattleman who has used it. Such cattle pass through our winters in a fine, healthy, growing condition. Cotton-seed cake has been the salvation of the Southwestern cattleman.

Will Feed Cotton-Seed Cake Instead of Corn in the Future.

Mr. M. E. Richardson, Rice County, Kansas, writes:

"March 21, 1913.

Dear Sir:

I have yours requesting my opinion of cotton-seed meal or screened cracked cake as a feed for cattle.

Last year, I wintered through 250 head of cattle on hay and cake. This winter I am trying hay and corn on about the same number and while last winter was a very bad winter my cattle did much better than they have this winter and from this time on, I will feed cake and hay."

Likes Cotton-Seed Meal with Ensilage.

Mr. C. C. Eisiminger, Andrew County, Missouri, says:

"March 21, 1913.

Dear Sir:

Your card at hand. I like cotton-seed meal for a winter feed. I give my cattle about five pounds a day with about 30 lbs. of ensilage and 15 lbs. alfalfa hay.

My cattle do well and gain right along all winter."



Fattening Cattle on the Range.

Since the introduction of cotton seed meal and cake as a range feed, many feeders have tried to fatten their cattle with it upon the range, and with or without success according to the methods used. The cotton-seed meal is not suitable for range feeding for obvious reasons. The cake, broken up into small nuts, may be poured out upon the ground and picked up by the cattle with little loss. The first attempt to fatten cattle upon the range was to haul out a load of cake to a central place upon the ranch and call up the cattle and scatter out the cake to them. It did not take long for the cattle to become trained to an understanding of the purpose of the call. Hence, in a short time they would respond to it, often running a mile or two to get a meal. The result of course was that they ran off so much fat that it was not practicable to fatten in this manner.

One of the first ranchmen to successfully fatten cattle upon the range was Mr. T. J. Clegg of the San Angelo country, Texas. He is an experienced feeder, having fattened as many as 7,000 steers in one season. His plan of range fattening is a modification of the method just described as a failure. He sends two or three wagons out upon the range every morning. The drivers are instructed to stay out all day and not to call the cattle, but to drive to the cattle, throwing out a shovel full of cake here and there, wherever he found them. The cattle soon became accustomed to understand the purpose of the wagon and to hunt it when they heard the noise it made. In a little while it was no trouble to feed them this way and it was likewise no trouble to fatten cattle upon the range.

The advantages of range fattening are many. The grass takes the place of cotton-seed hulls and decreases the cost of feeding by that amount. The cattle are tamed to an extent that is valuable in handling them. They are not subjected to all the unfavorable conditions of penning. It saves much expense of hiring hands to do the feeding, for the ranch has to have a certain amount of help anyway. Thus, by a proper use of cotton-seed cake an additional revenue comes to the stock man. They say there is no other feed equal to it for keeping their cattle in a fine, healthy, growing condition as well as for fattening purposes, and no other feed that produces such a fine quality of meat.





This is a picture of the thorny prickly pear indigenous to the southwestern part of the United States and Mexico. This is nature's method of storing up food and water for the live stock of this territory. During long periods of drouth the thorns are burned off of this feeding stuff and it is fed to cattle in connection with cold press cotton-seed meal or with cotton-seed cake.



In the middle of this picture Mr. Anderson is seen calling the cattle which he is going to feed with cotton-seed cake. All cattle within the sound of his voice understand the meaning of the call.



Mr. Anderson puts the cotton-seed cake near the roots of trees or bushes so that the cattle will not tramp it into the ground. These range cattle eat about one pound per head per day. This keeps them in a healthy, thriving condition and gives them a good appetite which causes them to eat more of the coarse grasses than they would otherwise. In the spring time when the grass begins to grow these cattle begin to fatten at once.



Fattening Range Cattle in Pens.

The severest test to which cotton-seed meal, cake or hulls has ever been put, or to which it can ever be put, with respect to its adaptability as a food for farm live stock, is the one familiar to every man, woman and child of the South, viz., *the fattening of range cattle in pens for market with cotton-seed meal and hulls*. Quite a contrary opinion is generally held, however. It is such a common thing to see a pen of range cattle feeding upon cotton-seed meal and hulls that our own intelligent citizenship has come to think and to express its opinion that such a feeding ration is not suitable for any other kind of farm live stock. On the other hand, every pen of cattle, feeding upon cotton-seed products, is a concrete, living, and unanswerable argument that such a feed may be fed under any other conditions and circumstances arising with respect to feeding farm live stock. This fact is not only borne out by actual experience, numerous examples of which could be cited, but it is in accord with the fundamental principles of physiology and dietetics.

What has been the *ration* of a train load of *range cattle* which is going into the feeding pen? What has been their environment? Their *ration* of course varied with the locality from which they came, but in most cases in the South it has been mixed grasses of varying composition. They have lived all their lives almost if not altogether upon grass, either green or dry. From generation to generation they have been born and raised upon grass. Every cell of their bodies,—their muscles, blood, bones and hair, as well as their nervous organism,—has been formed and attuned to a peculiar food

and environment. They have perhaps never seen any form of *concentrated* food, especially in the Southwest. Thin of flesh and wild they are penned up close together, usually near the roar of the railroad trains and steam whistles, unprotected from wind and rain, and sleet and snow. In from 60 to 90 days these old dry bones must take on flesh and fat and become a finished product. And in fact the miracle is performed with *cotton-seed meal and hulls*.

What is the chasm between these two rations? The *ration of the range* (the *ration of heredity*) and cotton-seed meal and hulls? The nutritive ratio of the grasses they have been raised upon may vary from 1 to 25. It may be even greater than this. The nutritive ratio of prairie grass hay is 1 to 84. If, as is sometimes the case, sorghum fodder has been feed, they have become somewhat accustomed to a nutritive ratio of 1 to 22. But when these cattle enter the feed pen they at once and for the first time in their lives begin feeding upon a concentrated food having a nutritive ratio of 1 to 1.2! Think of it! Going suddenly from one extreme to the other! Cotton-seed meal is mixed with hulls and a nutritive ration of about 1 to 6 is obtained and maintained to the end of the fattening period.

Is this not a severe test of the digestive apparatus of an animal, and of the feeding value and wholesomeness of a feed ration? How does such a change agree with the well known principles of physiology and dietetics?

"In laying out a plan of alimentation the following points should be considered: The first change in diet should not be too great!"—*Max Einhorn, M. D., Diet and Nutrition, Professor of Medicine at the New York Post Graduate Medical School and Hospital.*

Another eminent authority, Professor I. P. Pavlov, Director of the Physiological Section of the Imperial Institute of Experimental Medicine, St. Petersburg, makes the following statement on the point in question, in his book, "*The Work of the Digestive Glands*":

"Every food determines a certain amount of digestive work, and when a given dietary is long continued, definite and fixed types of gland activity are set up which can be altered but slowly and with difficulty. In consequence, digestive disturbances are often instituted if a change be suddenly made from one dietetic REGIME to another, especially from a sparse to a rich diet, such, for instance, as happens after the long Russian fasts. These disturbances are expressions of the temporary insufficiency of the digestive glands to meet the new demands made upon them."



Steers feeding upon cotton-seed



A pen of cattle fattening upon cotton-seed meal and hulls in Guthrie, Oklahoma.

Many cattle are taken right up off the range from a long fast on a scanty diet poor in protein and put upon the richest diet known and stuffed to the very limit. The fact that *these* cattle thrive upon such changed feeding and under such changed surroundings is the most potent and convincing argument for cotton-seed products for farm live stock feeding that will ever be obtained from the experience of the practical feeder or from the Experiment Stations of our A. & M. Colleges.

The breed of range cattle experimented upon as explained above must be taken into consideration to fully appreciate the value of cotton-seed meal and hulls. When meal and hulls first began to be fed, the range cattle of the South and Southwest were scrubs, hard to fatten. In Texas, Oklahoma, and New Mexico these were the notorious long horn cattle, of long, thin bodies, long legs, and little loin. But it was possible to fatten these cattle upon cotton-seed meal and hulls.



Another pen of cattle fattening upon cotton-seed meal and hulls in Ballinger, Texas.



These are photographs of native steers of the southwestern plains of the United States and Mexico, known as "long horns." These steers never had any concentrated food until they were put into the feeding pens at Austin, Texas, shown in photographs, where they are being fattened upon cotton-seed meal and hulls.



A pen of steers fattened upon ensilage and cotton-seed meal.

Over-Feeding an Animal.

It is a well known principle of physiology that over-feeding is detrimental to any animal. This fact is expressed in the following language in Bulletin No. 115 of the Louisiana Agricultural Experiment Station:

"It is frequently the case that animals receive more food than is necessary for their most perfect health and working condition. There being a limit to the digestive powers, food that is partaken of above that required for proper maintenance (according to the class of animal and the work demanded), not only overtaxes the digestive organs and, consequently, excites diseases, but is an absolute waste."

"The most essential thing in feeding meal and hulls is to begin feeding a proper proportion of meal, and increase the meal slowly. It should also be seen that the meal and hulls are thoroughly mixed before feeding. The proportion of meal fed should be governed by the weight and age of the cattle.

The first ten days ration of feed used was 2½ pounds of meal and 18 pounds of hulls per head per day. The proportion of meal was increased slowly. The last ten days before shipping 8 pounds of meal per head was used. The average feed for 100 days, 5 pounds of meal and 30 pounds of hulls.

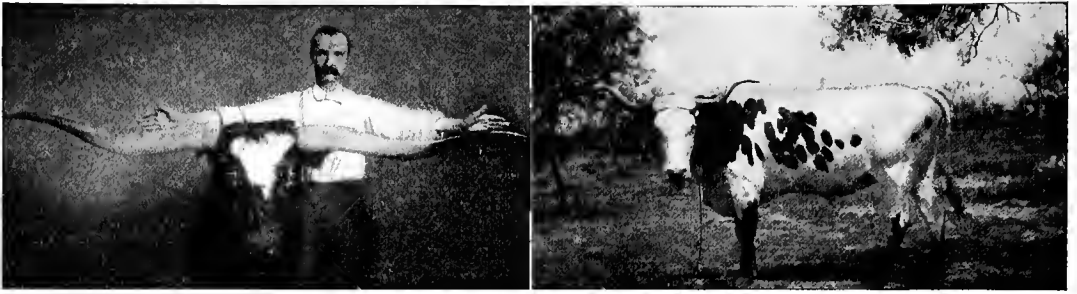
Sheds or wind-breaks should be used for protection against the cold weather, and a sufficient supply of water should be available at all times.

These steers were shipped to St. Louis in February. The land was plowed very deep, and planted in cotton, corn and cow peas. It produced nearly a bale of cotton per acre, which had previously taken 6 or 8 acres to make a bale of cotton. Corn yielded around 50 bushels per acre.

Any one owning their farms will make big profits by feeding cattle on their lands, whether or not they make a profit on the cattle, as the fertilizer alone will make a handsome dividend.—R. H. Winfield, Mgr., Enterprise Cotton Oil Co., Augusta, Ark."

Durant, Okla., Feb. 25, 1913.

"I have been a heavy buyer of the product of the Durant Cotton Oil Company of Durant, Oklahoma, for years, having fed thousands of cattle at their mill, and take this opportunity of expressing my appreciation of their courteous treatment and to compliment them on the grade of their product. I know of no feed which can be fed more economically, or will put on fat as quickly as cotton-seed meal and hulls. Considering the very high percentage of protein and fat in the meal, and when fed with cotton-seed hulls, I believe the combination to be the best and cheapest feed on earth.



The last of the "Long Horns." Owned by Ed. C. Lasater, Falfurrias, Texas, and kept as a reminder of the days that are gone.

"The small feeder, as well as the large, should use more of this product of the mills, and make money, and at the same time prevent the exporter from taking our cotton-seed meal for foreign buyers, who realize that in buying cotton-seed meal, they are getting more feed value for their money than in any concentrated feed known."—Hugh Holsell, President, Durant Cotton Oil Co., Durant, Okla.

"With corn selling at 60c. a bushel, the feeder places much dependence on cotton-seed meal or cake as an expense reducer. I feed it to all my cattle and would not know what to do without it. It is a great flesh producer and as a hair finisher it has no rivals. Getting the hair into shape is one of the hardest things a feeder has to do as the value of the skin of the animal puts much more worth on it, and is an asset to every steer sold. This shipment I just marketed I fed for five months on clover hay, corn and cotton-seed meal. They were yearlings and their gain was remarkable. They averaged 865 pounds and at \$6.85 per cwt. made me money. I was well satisfied with the sale and cannot say too much good of the St. Louis market."—C. H. Terry, Cattle Feeder, Jersey County, Ill.

"Considering the excellent results secured from cotton-seed meal during the time it was fed, together with the fact that the two lots of horses seem to have been so nearly of equal average feeding qualities, there is every indication that the ration containing cotton-seed meal was in no way inferior and probably was slightly superior to the linseed oil meal ration in efficiency."—Bulletin 109, Experiment Station, Iowa State College. *The Value of Corn, Oil Meal, Cotton-Seed Meal and Gluten Feed in Work Horse Rations.*

"The addition of cotton-seed meal to a ration of shelled corn and clover hay, resulted in a more rapid and cheaper gain, a higher finish and a greater profit per steer."—Bulletin 136, Purdue University Agricultural Experiment Station, Lafayette, Ind.

"The three rations fed to steers gave percentage of gain and the greatest daily average gain in the following order: Cassava, cotton-seed products and corn meal.

The result of feeding showed a profit on the investment as follows: Cassava, 48.82 per cent.; cotton-seed products, 87.43 per cent.; corn meal, 14.69 per cent."—Bulletin 55, Florida Agricultural Experiment Station.

Would Not Attempt to Feed Without Cotton-Seed Meal or Cake.

Mr. G. B. Kelly, of the well-known firm of Verner-Kelly Commission Co., Kansas City, Mo., writes:

"March, 27, 1913.

In answer to your inquiry as to cotton-seed meal and cake I wish to say that I have been using both the meal and screened cracked cake for the past eight years and will say that I find it a very valuable feed both for fattening cattle and also for wintering cattle on the range, as I have used it quite extensively in both cases. In fattening cattle for beef market, I use the meal with either corn chops or shelled corn, and in carrying cattle through the winter, to graze the following summer, I used the screened cake. Have used this cake in Kansas, where we use hay and other forage feed as roughness, and have also used it in the Panhandle country of Texas, where cattle graze the old grass as roughness. I would not attempt to full-feed cattle for the beef market without a ration of cotton-seed meal, nor would I expect to winter cattle in either Kansas or Texas without a ration of the cotton-seed cake."

Useless to Try to Feed Without Cotton-Seed Meal and Ensilage.

Mr. Fred McCullough, successful feeder of Poweshiek County, Iowa, says:

"March 8, 1913.

Yours of the 6th inst. asking for my opinion in the feeding of cotton-seed meal received and in reply will say that I have been using it in connection with silage for some years and find it an excellent feed and it is almost useless to try to feed silage in feeding cattle without the cotton-seed meal.

With this cheap ration we have made exceptional gains and always sell at near the top price."

Feeds Well Anyway.

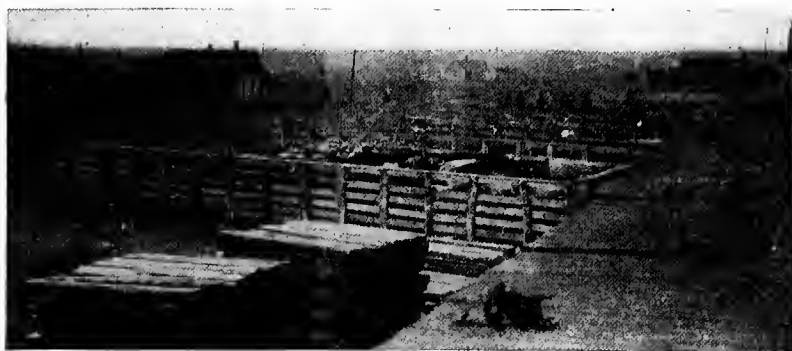
H. D. Hover, one of the most successful feeders in Greenwood County, Kansas, writes:

"March 20, 1913.

In regard to the feeding of cake:

I have found in my ten years' experience it is the cheapest feed I can buy.

Feeds well with our wild grass in the fall, feeds well with cane and I'm getting good results this year using it with ensilage."



A few pens of cattle fattened with cotton-seed meal and hulls and ready to be shipped to market.



Finds Cotton-Seed Cake the Cheapest and Best to Winter Cattle.

Englehart & Son, extensive feeders of Greenwood County, Kansas, say:

"March 19, 1913.

We think that cotton-cake is the cheapest feed that we can use to balance the ration. We half feed about 300 head per year.

When the grass commences to dry up in the fall, we commence with one pound per day, per head and gradually increase until the cattle are eating three pounds per day, then we haul them all the cane and caffir corn butts and prairie hay that they will clean up, stalks and all. We feed in the pasture until about Christmas, then move them into the feed lots and feed cane and caffir corn until the first of March, then put them on shock corn and alfalfa, feeding three pounds of cake all the while. We aim to take the corn away from them about two weeks before they go to graze.

This method of feeding costs us from \$15.00 to \$17.00 per head. The cattle are as good as those fed shock corn and hay all winter and costs \$20.00 to \$25.00, and will graze a lot better."

Has Fed Cotton-Seed Products for Twenty Years.

H. L. O'Bryan, well known feeder of LaBette County, Kansas, says:

"March 19, 1913.

For nearly twenty years I have been feeding cattle and using cotton-seed meal, screened cake and hulls with such excellent results, that I would not want to undertake to fatten a bunch of cattle without having some form of cotton-seed products to go with their other feed.

For finishing fat cattle, I use the cotton-seed meal with ground ear corn. For wintering aged cattle I like the screened cake."

Gets Big Gains.

M. I. Mullins, one of Iowa's most successful feeders, of Dallas County, writes:

"March 14, 1913.

In regard to my feeding:

I feed ground corn, cob and choice screened cracked cake.

I grind corn and cob and cotton seed cake all together and my feeding is all done under roof and my barns are all cement floors.

You must give cattle the very best of care if you make good gains. I have made gains as high as four pounds a day and held it for 106 days straight."

Will Not Feed Inferior Feed.

Mr. B. B. Huckell, Ray County, Missouri, writes:

"March 8, 1913.

Yours to hand in regard to the feed that I use in fattening cattle and will say that I use four pounds of screened cotton-seed cake or meal, twenty pounds corn silage, five pounds of alfalfa hay every other day and all the shelled corn they will eat and I usually get an average of three pounds a day. Have got as high as four pounds but that is unusual.

I have been feeding cattle for years and have found that I get better results with the above rations and have less loss than any other ration I have fed. I did not think the cotton-seed meal or cake was of much value until three years ago, I heard so much talk that I decided to try it myself and I would not think of doing without it now. It seems to be just what was needed to make a balanced ration.

I think a person should be careful about getting feed of good quality as so many seem to think that most any kind of feed will be all right for cattle, but I have found that the best is cheapest and I, for one, am going to let the other fellows feed the inferior feed."



No. 19.

A train-load of 22 cars of cattle on its way to market. These cattle were fattened on cotton-seed meal and hulls.



The Death Loss is Less.

A. G. Williamson, extensive dealer of Grant County, Kansas, writes:

"March 11, 1913.

In regard to your letter:

I am not in position to answer thoroughly, although I sold sixteen cars last year of the screened cake.

Last year was a very hard year on cattle, the storm setting in the last of November and lasting until the first of April, with an average of 12 inches of snow on the level.

Most stockmen were out of all kind of roughness in three weeks. They used from 1 to 2 pounds of cake per head.

One man I know of had plenty of grain and no cake, fed plenty of grain and was the heaviest loser in the country, only saving 17 head out of 43 head, while parties with plenty of cake didn't average losing over 5% of their cattle. There is nothing cattle can live on as long as a small amount of cake."

Makes Three Feeds Instead of Two.

Mr. T. D. White, of Carroll County, Missouri, writes:

"March 10, 1913.

In reply to yours in regard to my opinion of cotton-seed meal or cake as a feed for cattle:

In all my cattle feeding in winter and dry lot feeding for the last ten years I have used cotton-seed products and have been well pleased with results.

Feeding the concentrated feeds shortens the feeding period about two months, or in other words, I make three feeds with the same money I used to do only two feeds."

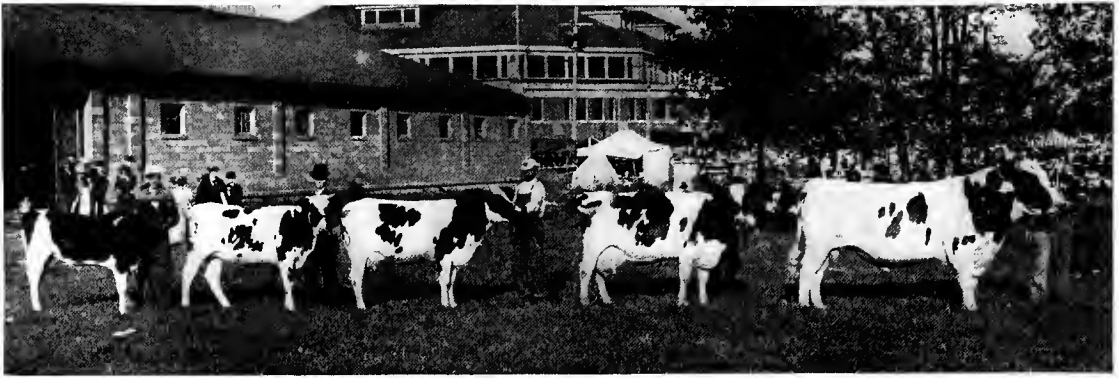


"After spending over fifty years of my life in feeding, breeding, and shipping live stock in one of the north central states where corn is the chief food for all kinds of stock, three years ago I came to Texas (I regret that I did not come forty years ago) on account of the fine climate. I had made up my mind to quit the live stock game altogether. But the old live stockman knows too well how I kept my word. We cannot forget our first love. So here I am in Dixie Land, worrying and fretting and feeding and forgetting my years. But you wanted to know what I think of cotton-seed products. I will not tell you what I have read, but will tell you in a plain, horse sense way, what we have done. Two years ago we began feeding a few cattle, just nibbled a little, to get onto the ropes. I was much better pleased with results than any cattle I ever fed on corn in the North. I fed a few more this winter, and I am highly pleased with the results.

We have also been feeding from 100 to 300 sheep. I mean we keep about that many in the lots all the time. Most of these are coming yearlings. The results are very gratifying. Indeed, it is remarkable the amount of meal a sheep can consume. Lambs weighing 45 to 50 pounds when they went into the feed lots soon came to full feed of 2 pounds per head daily. It is a remarkable fact that we have not lost a sheep from the effects of the food we have given them. We feed a small amount of oats with the cotton-seed meal, but only when I am crowding them heavily on meal.

We also kept about 100 head of hogs on the farm like most farmers—hogs of all ages and sizes. We began to feed very cautiously as we were warned. We let them run on wheat pasture and feed other feeds but I notice the ones that get the most cotton-seed meal are moving up their greasy trail as the business was rushing in the interior.

When I first began to feed cotton-seed products, I asked many farmers for information but their opinions were so varied that I decided to 'take the bull by the horns' and follow the motto of 'The lark and the farmer'; I am satisfied with results. Some farmers told me that oil meal would kill hogs. So will corn kill sheep and cattle if you do not know how to feed it. Were I to decide to feed in the North again, cotton-seed products would be the principle feed as it is both a pleasure and a profit to feed it."—Thomas F. Boyer, Ft. Worth, Tex., R. F. D. No. 3.



"Whitesboro, Texas, Feb. 24, 1913.

*Whitesboro Cotton-Oil Co.,
City.*

Gentlemen:

I have run a meat market in this town for 19 years, and for the past 12 years, winter and summer, I have fed meal and hulls for fattening the stock which I kill. I have fed cattle on this feed for 5 months prior to butchering, and believe I could have fed them on indefinitely without any injury to them. I get better results and a much greater profit when feeding meal and hulls to beef cattle than from any other feed.

Yours truly,

*E. L. Mills, Proprietor,
City Meat Market."*

Rations

Fattening Steers.

Successful ration used by R. H. Winfield, Augusta, Ga.:

Cotton-seed meal	5	pounds
Cotton-seed hulls	30	"

Successful ration used by C. C. Esiminger, Andrew County, Mo.:

Cotton-seed meal	5	pounds
Ensilage	30	"
Alfalfa hay	15	"

Successful ration used by B. B. Huckell, Ray County, Mo.:

Cotton-seed meal	4	pounds
Corn ensilage	20	"
Alfalfa hay, every other day	5	"
All the corn they will eat.		

Successful ration used by M. I. Mullin, Dallas County, Iowa:

Cotton-seed cake.	Corn on cob.
Equal parts ground together.	

Daily Ration for Fattening Cattle.

Amount for 1000 lbs. Live Weight.

Ration No. 1:

- 17 lbs. Corn.
- 4 lbs. Cotton-seed meal.
- 8 lbs. Cotton-seed hulls.
- 15 lbs. Sorghum silage.

Ration No. 2:

- 14 lbs. Corn.
- 3 lbs. Wheat bran.
- 3 lbs. Cotton-seed meal.
- 12 lbs. Sorghum hay.

Ration No. 3:

- 18 lbs. Corn.
- 4 lbs. Cotton-seed meal.
- 12 lbs. Sorghum hay.

Ration No. 4:

- 12 lbs. Corn.
- 4 lbs. Cotton-seed meal.
- 14 lbs. Cow-pea hay.

Ration No. 5:

- 12 lbs. Corn.
- 4 lbs. Cotton-seed meal.
- 14 lbs. Alfalfa hay.

Ration No. 6:

- 6 lbs. Cotton-seed meal.
- 30 lbs. Cotton-seed hulls.

Ration No. 7:

- 18 lbs. Corn.
- 4 lbs. Cotton-seed meal.
- 12 lbs. Cotton-seed hulls.

Daily Ration for Growing Cattle.

Amount for 1000 lbs. Live Weight.

Ration No. 1:

- 12 lbs. Corn.
- 2 lbs. Cotton-seed meal.
- 5 lbs. Wheat bran.
- 12 lbs. Cotton-seed hulls.

Ration No. 2:

- 14 lbs. Corn.
- 3 lbs. Cotton-seed meal.
- 4 lbs. Wheat Bran.
- 12 lbs. Sorghum hay.

Ration No. 3:

- 12 lbs. Corn.
- 2 lbs. Cotton-seed meal.
- 15 lbs. Corn silage.
- 10 lbs. Cow-pea hay.

Ration No. 4:

- 6 lbs. Corn.
- 2 lbs. Cotton-seed meal.
- 20 lbs. Corn silage.
- 12 lbs. Cow-pea or alfalfa hay.

Ration No. 5:

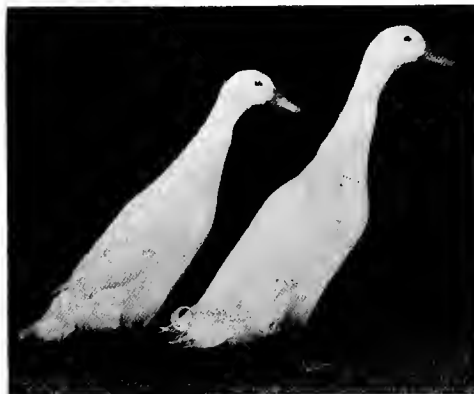
- 6 lbs. Cotton-seed meal.
- 25 lbs. Cotton-seed hulls.

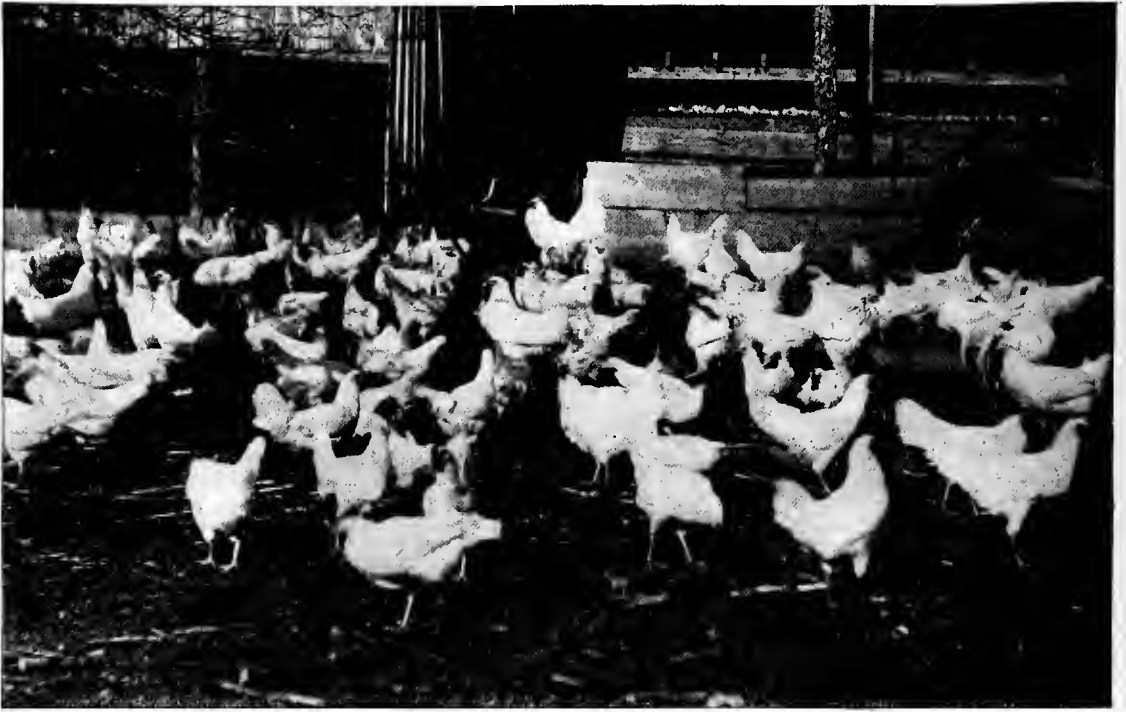




Chapter IV.

Poultry Feeding





Poultry Feeding

WHENEVER there is any attempt to raise more poultry than the family consumes, the feeding problem presents itself here just as in other farm live stock feeding. The same fundamental principles of nutrition obtain here as elsewhere—underfeeding, overfeeding, kinds of feeding stuffs, etc., etc.

The following observation of "The Cornell Reading Courses, Vol. I, No. 10," is worthy of mention here:

"Quantity and Quality of Food.

It will readily be conceded that if chicks are not given sufficient food to supply their bodily requirements, they cannot be expected to grow satisfactorily. It is equally true that the food may be abundant but of such a quality that it will not yield sufficient nourishment. For example, chicks fed on a ration consisting largely of bran or some other material containing a large proportion of indigestible fiber could not eat enough of the food to supply the needs of their bodies, although their crops might be constantly full. On the other hand, chicks fed chiefly on beef scrap or on sour milk curd would, in their efforts to fill their crops, get more food material than they could possibly digest.

In the first case the chicks would be starved, and in the second they would be overfed. Chick foods sometimes contain a high percentage of small seeds encased in



a hard shell, such as millet. The digestive organs of young chickens may not be able to crush this shell, and the chicks may thus eat a large quantity of the grain while obtaining little nourishment from it.



"Cracked and Ground Grains.

Chicks appear to need both cracked and ground grain.

"Animal Foods.

Fowls seem to need animal food. In the natural state the chicks are reared at a season when the supply of insects and earthworms is abundant, and the mother hen exerts herself to procure this food for her brood. One flock, however, was given the mash mixture and beef scrap, with no cracked grain. For this flock the quantity of beef scrap consumed was more at times than all the other food. Eighty-nine per cent. of these chicks died of digestive troubles before they were seven weeks old, probably because of their abnormal consumption of a highly concentrated food.

A Good Ration for Chick Feeding.

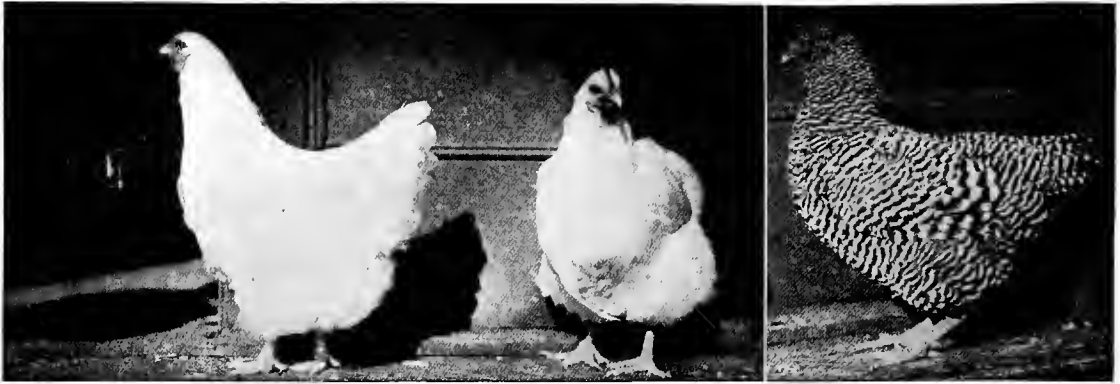
From the first day to the fourth, the following mixtures may be used.

	By Weight
Rolled Oats	8 parts
Bread Crumbs	8 parts
Sifted Beef Scrap.....	2 parts
Bone Meal	1 part

Subsequent Feeding—The following mash moistened with skimmed milk should be substituted gradually for the bread, rolled oats, and beef scrap:

	By Weight
Wheat Bran	3 parts
Corn Meal	3 parts
Wheat Middlings	3 parts
Sifted Beef Scrap.....	3 parts
Bone Meal	1 part

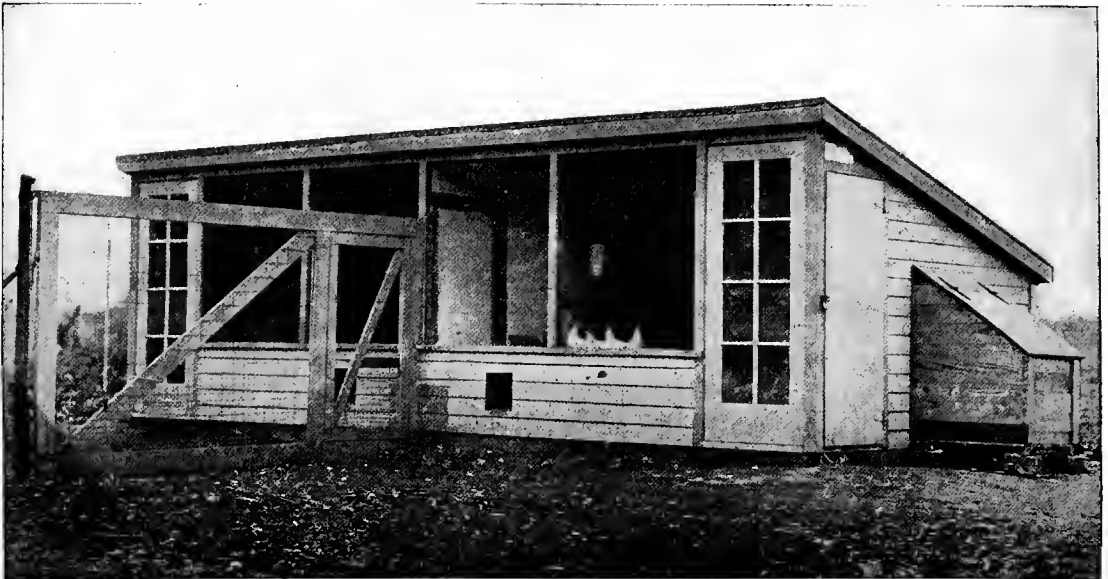




The moist mash should be fed two or three times a day. Cracked grain should be given at least twice a day, scattered in light litter as soon as the chicks are able to find it. Mash in dry condition should be kept in a shallow tray before the chicks. Grit, charcoal, and fine cracked bone should be fed in separate trays or hoppers. When four weeks old the chicks should be receiving two meals of the mash and three of the grain.

Beef scrap should always be carefully inspected before it is fed, in order to make sure that it is free from taint and from mustiness. Sifted beef scrap sometimes becomes musty in storage unless it is kept in a very dry place. In any case, beef scrap should never be supplied to chicks in sufficiently large quantities or under such conditions that it may possibly become musty before being consumed."

The danger with beef scrap is that it is hard to get it in an undecomposed condition. And if it is clean and undecomposed it is too valuable to feed to fowls. Cotton-seed meal, having a high per cent. of *protein* and *ash* can be substituted for the beef to great advantage.



An open front chicken house. Chickens, like other farm live stock, do better when protected from the weather and fed with the food rich in protein and ash like cotton-seed meal.

Importance of Protein and Ash in Poultry Feeding.

Circular 37, Purdue University Agricultural Experiment Station, La Fayette, Indiana, thus speaks of the importance of *protein* in a chicken ration:



"When quick growth is desired, a ration made up wholly of grain will be found to be deficient. To overcome this deficiency, some feed containing more protein or that which will make flesh, feathers, blood, etc., is necessary."



The following statements taken from the West Virginia University Agricultural Experiment Station, Morgantown, W. Va., show how important it is to have plenty of *ash* as well as *protein* in a ration for chickens, and that a *vegetable protein* is just as valuable as *animal protein* for chickens. Cotton-seed meal has five times as much *protein* and *ash* as corn and therefore is not deficient in these important constituents as are the grains and not subject to the objections raised against grains:

"As compared with the composition of an egg, most of the *grains* commonly employed as poultry foods are too low in *protein* and *ash*.

"In feeding for egg production it is necessary not only to have the proportion of protein to carbohydrates approximately correct, but it is also essential to have the ash constituents of the ration sufficient in amount. There is nearly eight times as much ash in the dry substance of an egg as there is in corn or wheat, and this deficiency must be made good in some way.

"Animal Versus Vegetable Protein.

"Most of the earlier experiments performed to study the relative value of protein from animal and vegetable sources seemed to show that the protein of animal origin is more valuable than vegetable protein for growth and egg production, but it has been found that the apparent superiority of animal protein is due partly, if not entirely, to the fact that it is usually associated with a larger percentage of ash in the ration. As soon as the difference in ash content is overcome then protein from the two sources seems to have practically the same value. Professor Wheeler, of the Geneva Station, in speaking of his investigation, says: 'The experiments all point in one direction: toward the superiority of rations containing animal food over those made up of grain. In no case has the reverse of this proven true, and in nearly all the trials the difference has been most noticeable. *When the lack of mineral matter in all grain ration, as compared with one containing animal meal, is supplied by bone ash, the difference disappears or favors the grain ration, so far as chicks and laying hens are concerned.* That is, it is the small amount of ash in the grain ration which makes this ration inferior to one containing animal meal, rather than a difference in the protein. Something to supplement the ash-poor grains they must have, and it is simpler to give it in the natural form, combined with valuable proteins and fats, than to burn out the organic matter and give the ash only.'"



White Indian Runner ducks owned by W. J. Mitchell, Denton, Texas.
Cotton-seed meal forms a part of the daily ration of these ducks.

Cotton-seed meal, containing as it does five times as much *protein* and *ash* as corn meal, added to a grain ration for chickens overcomes the deficiency of these feeding stuffs in *ash* and *protein*, and, as above quoted, is a superior ration to the one containing beef scraps. Beef scraps are rich in protein, but contain less ash than cotton-seed meal. If the ash of cotton-seed meal is so available as it is in "Creepy" cattle, it ought to be all the more so with fowls, for it is a well established fact that "The animal with a gizzard" can utilize mineral matter in form of mineral salts to a much greater extent than other animals can.



White Indian Runner ducks owned by W. J. Mitchell, Denton, Texas.
Cotton-seed meal forms a part of the daily rations
of these ducks.

"W. J. MITCHELL

Breeder of

WHITE INDIAN RUNNER DUCKS

Denton, Texas, Jan. 29, 1913.

Mr. J. S. Abbott,
Austin, Texas.

Dear Sir:

Answering your recent inquiry regarding the food ration I use in feeding my white Indian Runner ducks I beg to say that when my ducks are old enough to eat mixed feed their ration, among other things, is composed of 10% cotton-seed meal. Cotton-seed meal contains the essential property of meat, viz., protein, and is very much more economical than meat. Fowls fattened by it find a ready market because their meat is sweet and tender, and of a very rich color. I feed it also to laying fowls, because it is a great egg producer, and the eggs have a fine flavor and color.

Very respectfully yours,
W. J. Mitchell."

"I have never had any trouble getting enthused over a proposition when I knew absolutely that I was right and when I tell a man that cotton-seed meal is the best feed on earth I know I am right.

Cotton-seed meal has been fed to everything from a man to a chicken in this vicinity and it has scored every time. It is growing more popular each season.

We can't help but feel that we have done a man a favor when we sell him meal and hulls and we like to see them being hauled out whether they come from our mill or not."—R. S. Davitte, Dublin, Texas.





"Regarding cotton-seed meal for fowls must say that it beats anything I have ever used. My son had a hen which hatched chickens in the blacksmith shop here at the mill on Thanksgiving day, November 28, 1911; in middle of February they were as large as their mother. They are of the Plymouth Rock variety, which is a large variety of chickens and several of these young chickens commenced to lay the latter part of February. Out of the 11 young chickens nine are hens and all are laying now.

"This is something remarkable. These chickens are fed half cotton-seed meal and half corn chops, mixed together and dampened so they can pick it up better. During the day they run about the mill and in the mill and help themselves to meal at the cake mill and to the meal room, so I cannot state how much meal they do eat during the day outside of the meal and corn chops fed them morning and evening.

Most of our farmers feed meal to their chickens and as the dairy business is quite an item here, nearly all farmers sell cream and raise chickens. The chickens feed in the feed troughs with the cows and those are the best layers and best plumaged fowls.

Schulenberg ships over 52 straight cars of eggs annually, besides all the express shipments on four daily trains run up in the thousands of cases annually. They usually load 900 to 1200 cases of eggs to a car, so you can see that the chicken and egg business is quite an item here. Besides, they are shipping chickens to market daily. Chickens are sold by weight and cotton-seed meal fed with corn chops or other feed will soon double the weight of the chickens in a few weeks."—G. A. Baumgarten in "Farm and Ranch."



MRS. JAMERSON'S TURKEYS.

The above is a picture of Mrs. Albert Jamerson, Route 2, Iredell, with her turkeys, which she feeds regularly on cotton-seed meal.

Mrs. Jamerson advises us that since she has adopted this feed for her turkeys and chickens, they have been much healthier, producing more eggs and better disposed fowls, than from any feed she has ever used heretofore.



"We have had experiments at this station with the feeding of cotton-seed meal to chicks. The impressions which we have obtained from such experiments, the results of which are not yet completely written up, are that the protein in cotton-seed meal is practically as efficient as that in meat meal, although cotton-seed meal will not be consumed in such large quantities by the chicks. When the chicks, however, are limited to the same amount of protein in the two concentrates mentioned above, they will make about as good use of one as of the other. We have never found any evidence that cotton-seed meal was toxic to chickens in such amounts as they could be induced to eat along with low-protein accompanying feeds."—Burt L. Hartwell, Ph. D., Director and Chemist, Agricultural Experiment Station, Kingston, R. I.

"Dublin, Texas, Jan. 13, 1913.

To Whom This Concerns:

For a number of years I have kept a small flock of hens, usually about fifty, on a small town lot.

About two years ago, I began to experiment with cotton-seed meal as a poultry food. My experiment convinced me that it is a fine feed for chickens.

During the past year I have kept a dry mash, thoroughly mixed, before my hens at all times. This mash was composed of:

<i>2 parts, by measure.....</i>	<i>Cotton-Seed Meal</i>
<i>2 parts, by measure.....</i>	<i>Wheat Bran</i>
<i>1 part, by measure.....</i>	<i>Corn Meal</i>
<i>1 part, by measure.....</i>	<i>Choice Beef Scraps</i>
<i>1 part, by measure.....</i>	<i>Shipstuff</i>
<i>1 part, by measure.....</i>	<i>Alfalfa Meal</i>

This alone with a little scratch feed, in litter night and morning, has kept them in perfect health, and the egg yield has averaged about fifty per cent. of the total number of hens.

I am sure that the cotton-seed meal has increased the egg yield wonderfully in my flock."—J. W. Dunlap, Supt. Public Schools.

"As an egg producer, and to force the growth of young chickens, cotton-seed meal has no equal. In less than 10 days after beginning to feed cotton-seed meal to my 20 chickens I was getting from 9 to 14 eggs a day. I can recommend cotton-seed meal to anyone who appreciates yard eggs and fine, fat chickens."—O. W. Flynn, Dublin, Texas, February 18, 1913.



Rations for Chicken Feeding.

Successful ration used by G. A. Baumgarten in "*Farm and Ranch*":

	By Weight
Cotton-seed meal	1 part
Corn chops	1 part
Moistened with water so it could be picked up well by chickens.	

Rations for Fowls.

The chick should not be fed during the first 36 to 48 hours after it is hatched.

From the second to fifth day, the following mixture may be used, since cotton-seed meal is just as valuable as beef scrap:

	By Weight
Rolled oats	8 parts
Corn-bread crumbs	8 parts
Cotton-seed meal	2 parts
Bone meal	1 part

This mash should be fed dry or only slightly moistened, preferably with skim milk. If rolled oats are not available the following mash ration may be used:

	By Weight
Corn-bread crumbs	8 parts
Hard-boiled eggs	4 parts
Cotton-seed meal	2 parts
Bone meal	1 part

From the fifth day on the following mash may be fed:

	By Weight
Wheat bran	3 parts
Corn meal	3 parts
Wheat middlings	3 parts
Cotton-seed meal	3 parts
Bone meal	1 part

This mash slightly moistened, preferably with skim milk, should be fed two or three times a day.

Where wheat middlings are not available the following mash may be used:

	By Weight
Cotton-seed meal	2 parts
Corn meal	2 parts
Wheat bran	2 parts
Bone meal	1 part

But because cotton-seed meal has twice as much mineral matter as beef scraps, the bone meal need not be used at all.

In addition to the above mixtures, cracked grain should be fed to fowls of all kinds, and should be thrown out into the litter so they will have to scratch for it.

The mash should be put in a box so it cannot be wasted.
Fowls need green feed which they can usually get in abundance.



SPRING LAKE PLANTATION.
Where every living thing eats cotton-seed products.





Chapter V.

The Hog



SPRING LAKE PLANTATION BERKSHIRES.

The Hog

THE swine—*Sus Scrofa*—can be traced back to the highest antiquity. Its remains are found during the Pliocene Age, and he is contemporaneous to man at all periods. The crude drawings found in Brittany and other places picture the swine with the elk, the cavern bear, and the mammoth. During the Bronze Age, in Britain and in the northern part of France, the bones of hogs have been found in the graves of man, representing the part of the provender for the journey into the lower world, thus showing that even at this distant date and primitive condition, the hog was used as food for man. Egyptian, Aryan, Chaldean and Jewish civilization relate continually in their law books to the hog as a companion to and a means of food for man. Jewish laws, followed later by the Mahomedan regulations, speak of the use and danger of hog meat, and Moses, this wonderful leader of man, uses religion and the fear of an unknown deity as a means of impressing the rudiments of hygiene upon his ignorant followers.

Anatomically speaking, the hog has been intended by nature for a semi-aquatic condition. The soft snout, the powerful head, the lean body, the heavy tusks, everything in its make-up, indicates the rooting habit. In its free and natural condition, like most pachyderm, its chief food must have been the roots and tubers of the swampy regions of the old and new world. The struggle for existence, under probably adverse and difficult circumstances, has made the hog an eminently omnivorous animal. Our domesticated hogs have inherited the tendency to select their food from a variety of substances. Again, amongst natural conditions, the hunt for food with its enforced activity, did not allow any undue accumulation of fat, and the hog in its free state, or semi-domesticated condition, became the lean razor-back or the peccary of our Southwestern plains. First, a game animal, dweller of the forest, an easy victim to the crude weapons of man, the hog seems to have played an important role in his early economy.

For a long period, man derived the necessary fats for his daily use from the fruit of his hunt or from his domesticated animals. Bear, deer and other game, in his pre-civilized condition, sheep and oxen, in his nomadic condition, supply these necessities of life. From a hunter, man becomes a herder, and from a herder a tiller of the soil; he becomes sedentary, tied to this soil that furnishes him his living and surrounds himself with domesticated animals—dogs, cattle, sheep and amongst them, the swine.

Easily tamed, easily fed, fecund even in confinement, the hog has been domesticated by man from the earliest time; omnivorous, easily kept, gentle to a certain extent, feeding on any kind of refuse, the hog prospers in the midst of dirt and neglect. His name becomes synonymous with anything vile and filthy.

Being a non-perspiring animal from hereditary necessity, he seeks during the hot summer months to cool his body in water, and wallows in this



mud that surrounds the habitation of man—as clean, or as dirty, as man himself.

With increased civilization, the settlement builds itself to villages, the villages to towns, the towns to cities, the demand for easily obtained food increases a hundred fold, and man, through breeding, modifies the original type of his modest and calumniated follower.

There is a wide step between the lean wild boar of the Northern forest and the fat, abnormal, five hundred pound Berkshire or Poland China.

Man's selection interferes with nature's selection and while still one of the hardiest farm animals, the high bred hog of today has lost part of its original vitality.

Still, if years of domestication have modified the external appearance of the hog, his anatomical and physiological traits have been but little altered.

The study of his anatomy, and the conformation of his stomach, liver and bowels, added to what we know from the history of the hog, shows that nature intended for him to feed upon roots, tubers, water grasses, etc., obtaining per necessity, a large percentage of inert matter in the natural gathering of his food.

The hog is still the most economical producer of flesh or fat of all our farm animals.

He can utilize a wider variety of cheap food than any other domestic animal and still man seems to have entirely forgotten to take into consideration these conditions which are natural to the hog.

Again, the hog, made by nature a brother of the hippopotamus, *needs water, plenty of it*, both for drinking and bathing purposes. As said before, anatomically speaking, he cannot perspire and must find in water the necessary moisture to lower the temperature of his body. The same condition made him, in his natural state, hunt the water of the lakes and rivers, and the shade of the primeval forest.

Much could be learned and many mistakes spared, if the modern feeder could understand for what purpose this animal has been physiologically and anatomically intended.

Is it a wonder that with an unnatural food, unnaturally given in tremendous quantity, unnaturally bred for human purposes, in contradiction with nature's laws, the hogs of some of our experimental stations, within their six square feet pens, without any protection from the glaring sun, without any water, outside of what is strictly necessary for drinking purposes, should suffer and often die without any plausible explanation?



Registered Hampshire Hogs at Spring Lake Plantation, Louisiana.

"They eat no corn; cotton-seed meal and hulls and Bermuda grass make an ideal hog ration, and will make the South the great hog-producing country of the world.

Jo W. Allison."

Hog Rations.

The Westbrook Method.

T. C. Westbrook, Waco, Texas, who is a breeder of Duroc-Jersey hogs, feeds growing hogs equal parts of corn and cotton-seed meal, but separately. The cotton-seed meal is made into a thin slop, and fed fresh or fermented. The amount fed varies from one-half to two pounds of cotton-seed meal, and an equal amount of corn per 100 pounds of hog weight, depending upon the grazing and upon whether the hog is growing or fattening.

The amount of digestible nutrients in 100 pounds of this ration is as follows:

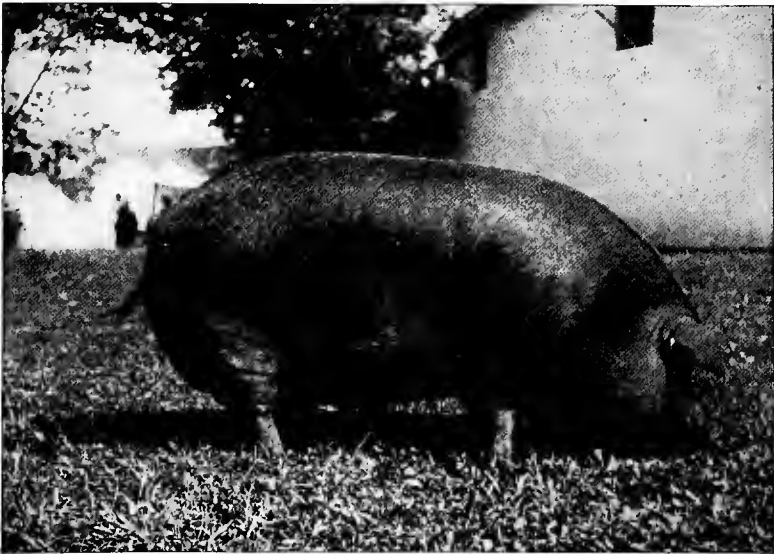
Hog Ration.			
<i>Feeds</i>	<i>Protein</i>	<i>Digestible Carbohydrates</i>	<i>Fat</i>
100 lb corn	7.1 lb	62.6 lb	2.3 lb
100 lb cotton-seed meal	37.0 lb	17.0 lb	12.0 lb
Total in 200 lb mixture.....	44.1 lb	79.6 lb	14.3 lb

The ratio of the protein to the other food constituents is too great unless the hogs have plenty of grazing as they have on the Westbrook farm.

Rice polish may be substituted for corn when the scarcity or cost of corn makes it profitable to do so, and then the following ration is made by Mr. Westbrook:

Hog Ration.			
<i>Feeds</i>	<i>Protein</i>	<i>Digestible Nutrients</i>	
	<i>%</i>	<i>Carbohydrates</i>	<i>Fat</i>
	<i>%</i>	<i>%</i>	<i>%</i>
100 lb cotton-seed meal	37.0	17.0	12.0
100 lb rice polish.....	7.3	64.4	4.3

On the Westbrook farms, the hogs eat much or little of the above ration, according to whether they are young or in the fattening pens, and according to the amount of grass and other feeds available.



A DUROC-JERSEY HOG.

According to Farmers' Bulletin No. 411, U. S. Department of Agriculture, the Duroc-Jersey is exceedingly well adapted to the South. It is a prolific breed, good milkers and mothers, the best grazers and strong and active.

Mr. Westbrook feeds his hogs a mixture of cotton-seed meal and corn, or a mixture of cotton-seed meal and rice polish in addition to the grazing that they have. They are furnished an abundance of shade and water, hence he does not have any losses.



If grazing is poor, or lacking entirely, the following ration should be adopted:

	<i>By weight</i>
<i>Corn, cotton-seed hulls, rice polish, wheat bran, or shorts.....</i>	<i>2 parts</i>
<i>Cotton-seed meal</i>	<i>1 part</i>

The Allison Method of Feeding Cotton-Seed Meal to Hogs.

Make a mixture by weight, about one-third cotton-seed meal, one-third cotton-seed hulls and one-third rice bran, corn chops, whole corn, wheat bran or shorts, whichever is most available. Mix with water to a thick mush in two vessels (an old barrel sawed in two is good) and leave to sour or ferment, which will take from 12 to 48 hours, according to weather and other conditions; then feed from these alternately, using the contents of one, while that of the other is left to sour.

A good growing ration may be based on one pound of dry mixture per hundred pound of live weight. For quick fattening this may be doubled, quadrupled or even more largely increased. Indeed, the Texas Experiment Station fed as much as seven pounds of cotton-seed meal per day to hundred and fifty pound hogs, though this is extreme and uneconomical, if not positively dangerous.

When ready to feed, add fresh water to the feeding ration sufficient to bring to a thin slop, about the consistency of buttermilk and give the hogs all they will clean up.

All hogs eat it greedily and all thrive on it from the lordly head of the

herd to the tiniest grunter. But for "piggy" or suckling sows it is especially valuable, giving to the pigs both before and after farrowing a growth and vigor attainable with no other feed on earth.

In an experience of over thirty-five years I have never seen a hog refuse to eat it, or injured by it. Indeed, it is not only the best and cheapest feed on earth, but is an efficient prophylactic, and hogs fed on it seem entirely immune to any of the common ills that hogs are heir to.

As to the feeding value of cotton-seed meal compared with corn, chemical analysis, confirmed by years of practical tests, answers this. A hundred pounds of corn contains from six to ten pounds of protein, four to six pounds of fat and about sixty-five to seventy pounds of carbohydrates.

A hundred pounds of cotton-seed meal contains from forty-five to fifty pounds of protein, from eight to twelve pounds of fat and about twenty-five pounds of carbohydrates.

Daily Ration for Fattening Hogs.

Amount for 100 lbs. Live Weight.

Ration No. 1:

- 1 lb. Corn, rice polish, or wheat bran.
- 1 lb. Cotton-seed meal.
- 1 lb. Cotton-seed hulls, alfalfa meal, cow-pea meal, or wheat shorts.

Ration No. 2:

- 2 lbs. Corn, rice polish, or wheat bran.
- $\frac{3}{4}$ lb. Cotton-seed meal.
- 2 lbs. Alfalfa meal or cow-pea meal.

Daily Ration for Growing Pigs.

Amount for 100 lbs. Live Weight.

Ration No. 1:

- 1½ lbs. Wheat shorts, rice polish, corn meal, or wheat bran.
- 1 lb. Cotton-seed meal.
- 8 lbs. Skim milk.

Ration No. 2:

- 3 lbs. Corn.
- 1 lb. Wheat shorts.
- 8 lbs. Skim milk.

Ration No. 3:

- 3 lbs. Rice Polish.
- 1 lb. Wheat shorts.
- 6 lbs. Skim milk.

Ration No. 4:

- 2½ lbs. Corn.
- 2½ lbs. Cow-pea meal.

Ration No. 5:

- 3½ lbs. Corn.
- $\frac{1}{2}$ lb. Wheat bran.
- $\frac{1}{2}$ lb. Tankage.

Ration No. 6:

- 4 lbs. Corn.
- 16 lbs. Skim milk.

Ration No. 7:

- 1½ lbs. Corn.
- 2½ lbs. Shorts.
- 1 lb. Alfalfa hay.



THE POLAND CHINA HOG.



THE BERKSHIRE HOG.



Successful ration used by Jo W. Allison, Dallas, Texas:

	By weight
Cotton-seed meal	1 part
Corn or corn chops.....	2 parts

Successful ration used by J. N. Millner, Streetman, Texas:

Cotton-seed meal	1 gallon
Wheat bran	5 gallons
Salt	1 handful

Put into a barrel and enough water added to make a thin slop.

A little corn was fed dry, and hogs allowed to run on pasture.

"Now it is easy to see from the figures already given that corn is seriously deficient in protein, is not properly balanced and is an expensive and insufficient ration when fed alone; that cotton-seed meal in protein and fat combined is about five times, and in protein alone is about six times as valuable as corn, and while too rich in protein to be fed by itself, when combined with corn in the proportion of about two parts corn and one part cotton-seed meal, gives a ration which with ordinary grazing almost exactly fulfills the scientific requirements for a balanced hog feed, and of which the committee appointed by the Texas Swine Breeders' Association to report upon the feeding of cotton-seed meal, after a thorough investigation, say in their formal report, 'IS THE MOST ECONOMICAL RATION OF WHICH WE HAVE ANY RECORD.' When it is remembered that this is the solemn and deliberate verdict of a committee of expert and scientific swine breeders and feeders these words ring with importance to the whole South. For they mean that in cotton-seed meal, supplemented by her unquestionable climatic advantages and cheaper lands, the South can produce cheaper pork than the great corn belt of the Northwest, and this can but mean the ultimate transfer of the hog-producing center of the country from the Northwest to the South, and an added wealth and prosperity to our whole country."—

Jo W. Allison, Dallas, Texas.

Streetman, Texas, Dec. 10th.

"Editor Cotton and Cotton Oil News,

I am a breeder of the Duroc-Jersey hog, and have been so engaged for twelve years, having on hand at all times from thirty-five to seventy-five head—a few years as many as 100 head.

I sold one hog in October this year, weight 595 pounds, that brought me \$47.60, and he ate many pounds of cotton-seed meal. Last year I bought thirty-two half-breed Duroc shoats, sorry, long-haired, poor, slap-sided, sharp-nosed swine. I bought one thousand pounds of cotton-seed meal, one thousand pounds of wheat bran; I had corn. Those sorry shoats weighed from 25 to 50 pounds. I began to feed them in long troughs. I put in a barrel one gallon of cotton-seed meal to two ten-quart buckets of bran; put in enough water to make a moderately thin slop—just thick enough to pour out of a bucket easily. To each barrel of this meal and bran slop I put a handful of salt (once a day), and fed some corn dry. I watched the shoats every day, gave them the run of green pasture, oats and rye. When that was eaten up I fed green sorghum, increased the cotton-seed meal until the shoats' bowels were lax, then reduced the ration till actions became firm, then again gradually increased quantity of meal and bran until I was feeding one-third by measure of meal to two-thirds bran. They fattened and brought me big money because they were fed on cotton-seed meal, corn and bran.

Yours truly,

J. N. Milner."

"P. S.—I will add that I feed cotton-seed meal with bran to suckling sows and to little pigs. I think there is nothing better for them.

J. N. M."

"As will be seen later, cotton-seed meal has at least one valuable and safe place in our pork-making operations—a place where it can be fed in large amounts. It can, and should, be used along with corn in a short dry-lot finishing period after the pasture and grazing crops are exhausted. Corn is excellent for finishing up an animal when he is taken off of green crops, but corn with cotton-seed meal is still better, because, first, the gains are made more economically when the two feeds are used together; and, second, the meat and the lard of the animal are hardened more rapidly than when corn is used alone."—Farmers' Bul. 411, U. S. Department of Agriculture, 1910. *Feeding Hogs in the South.*

"Rough red rice in a mixed ration of cotton-seed meal and hulls gave better daily gains than a straight meal and hull ration, but not cheaper.

It is apparent that none of the feeds used, at the price paid, can economically take the place of cotton-seed meal and hulls for fattening steers.

Cold pressed cotton-seed cake and Johnson grass hay gave higher daily gains than cotton-seed meal and hulls, but at a much greater cost.

Ground rough red rice fed with cotton-seed meal is an economical ration for fattening hogs.

At no time during the experiment were there any injurious effects from the feeding of cotton-seed meal."—Bul. 135, Texas Agricultural Experiment Station, Ft. Worth, Texas. *Feeding Experiments with Steers and Hogs.*





Rations for Fattening Swine

"Dublin, Texas, Feb. 17, 1913.

Mr. Devite,
Dublin, Texas.

Dear Sir:

I have given cotton-seed meal a thorough test and find the results good. I have been feeding it to hogs for three years. I fed 450 head—five cars—of hogs in Oklahoma, and I topped the Ft. Worth market with two cars out of the five. I fed cotton-seed meal every day, commencing with $\frac{1}{4}$ pound per day a head and increasing until I had them on $2\frac{1}{2}$ pounds a day. I let the meal ferment from 12 to 24 hours according to the weather. I swilled them twice a day and gave them some corn. My neighbor fed corn straight; my hogs gained faster and finished out better and were fattened forty per cent. cheaper than his were. I lay my success to cotton-seed meal.

Since then, I have gone to raising hogs on my farm near Dublin. I have some of the highest bred hogs—Duroc—in the United States. I feed them cotton-seed meal twice a day and let them graze on oats or barley, also sorghum, and they do fine. I feed to all ages and don't have any bad results. I think it is the best feed for growing and fattening hogs in this country. There is no better feed for suckling sows. Cotton-seed meal mixed with wheat bran is the best feed for pigs I have ever tried. Last year, when feed was high, I fattened my hogs on seventy-five per cent. cotton-seed meal and twenty-five per cent. bran; the meat was sweeter and better than meat fattened on corn straight, and fifty per cent. cheaper. When people learn not to fear to feed cotton-seed meal, this country will be a pork selling country, instead of being a pork buying country. What I have done and am doing, others can do and will do.

Respectfully,

W. F. Warren.

P.S.—I am sending you a photograph of sixteen hogs weighing 200 lbs., $7\frac{1}{2}$ months old, raised on cotton-seed meal.

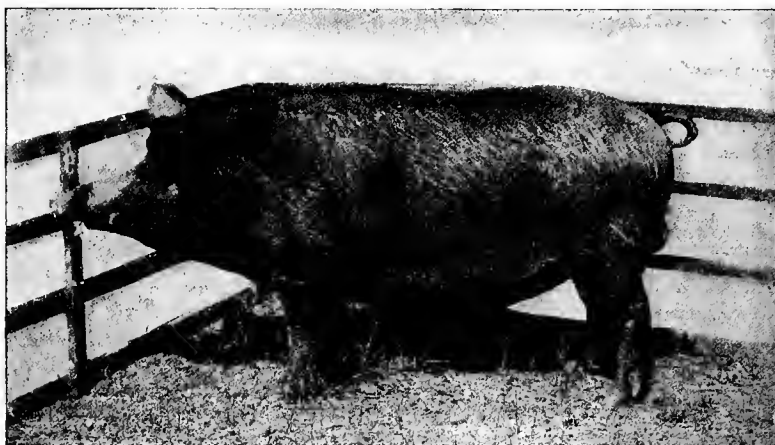


Corn alone, at prices approximating those that now prevail, is not a profitable ration to use in pork production.

Feeds richer in **PROTEIN** and **MINERAL CONSTITUENTS** should be supplied to supplement corn in a way to provide for the growth of muscle and bone as well as for the production of fat."—Bul. 209, Ohio Agricultural Experiment Station, Wooster, Ohio.

"Practical experience has been supplemented by carefully conducted experiments, both in the United States and Europe, with cotton-seed, cotton-seed hulls, and cotton-seed meal as food for cattle, sheep, pigs, horses, and mules, with the result of demonstrating their high feeding value for all kinds of farm stock, with the possible exception of calves and pigs.

The high feeding value of whole cotton-seed has long been recognized, having been fed raw, roasted, steamed, or boiled to live stock, especially to cattle. Almost from the beginning of cotton culture in this country it has been used to some extent as a feeding stuff, but since the introduction of the cotton-oil industry the superior feeding quality of the by-product—cotton-seed meal—has led to a very general displacement of whole seed by the meal in localities where the latter is easily and cheaply obtained."—Farmers' Bul. No. 36, U. S. Department of Agriculture, 1896. *Cotton-seed and Its Products.*



A GOOD TYPE OF THE TAMWORTH BOAR.

This is the ideal bacon type of hog. It is bred on a large scale by Ed. C. Lasater, Falfurrias, Texas, and according to his opinion is the proper type of hog for a hot climate, as it produces a fine quality of bacon and very little fat. Cotton-Seed oil is taking the place of hog lard, making it unnecessary to raise the fat producing types of hogs, especially in hot climates where it is difficult to raise them on account of the heat.

Mr. Lasater has plenty of buttermilk and ensilage which makes a good feeding ration for his young hogs. When he gets ready to fatten them he adds to this ration one pound of cotton-seed meal for each hog per day.

"Dublin, Texas, Feb. 7, 1913.

Dublin Oil Mills,

Dublin, Texas.

Gentlemen:

I have fed cotton-seed meal to my hogs and find it to be a great feed for them. I find that they grow faster, and fatten more quickly, and at a much less cost, than where they are fed entirely on corn or chops. It is also an excellent feed for horses and mules, giving them new life, and keeping them in a thrifty hearty condition generally.

Yours truly,

G. Howell."

"Giddings, Texas, 2/27/13.

Mr. C. M. Merchant, Mgr.,
Lee County Cotton Oil Co.,
City.

Dear Sir:

Referring to our conversation relative to feeding hogs on cotton-seed meal, below I give you some figures which I have kept for your information, as follows:

I bought 5 sows at \$9.00 each, \$45.00; these sows brought 30 pigs, and I fed them as follows:

For 90 days the 30 pigs and 5 sows were fed—
720 lbs. Cotton-seed meal,
720 " Rice Polish,
an average per day of 8 lbs. meal and 8 lbs. rice polish.

For 30 days the 30 pigs and 5 sows ate—
600 lbs. Cotton-seed meal,
600 " Rice Polish,
an average of 20 lbs. per day.

The cost of feed for 120 days was as below:

1320 lb Cotton-seed meal at \$27 per ton.....	\$18.09
1320 lb Rice polish at \$27 per ton.....	18.09

Total cost of feed.....	\$36.18
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At the age of 4 months these pigs were sold, also the sows, at the following prices:

30 pigs average 72 lb each @ \$6.50 per cwt.....	\$140.40
5 sows, average 250 lb each @ \$7.75 per cwt.....	96.85

Total	\$241.25
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Cost of sows.....	\$45.00
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Cost of feed.....	36.18
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\$81.18	81.18
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Difference.....	\$160.07
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The difference of \$160.07 is left for interest on my investment and my labor for 4 months.

The sows had no range nor the pigs either, and not even slop from the kitchen. The feed as I use it is made into a swill and stands for 24 hours, using the meal and rice in equal parts with 5 times as much water added.

Trusting these figures will be of interest to you, I am

Yours truly,

W. T. Heck."

"Waco, Texas, Feb. 17, 1913.

Mr. J. S. Abbott,
Austin, Texas,

Dear Sir:

I feed my hogs from $\frac{1}{4}$ to 1 lb. of meal per day with other feed. Horses and mules from two to three pounds per day with some grain and plenty of hay. I find my mules do much better work and their general health greatly improves. It will check cough caused from musty feed. I always soak my corn that is fed in connection with cotton-seed meal and sprinkle the meal over corn.

With best wishes,

Yours truly,

T. C. Westbrook."



Berkshire hogs, property of Jo W. Allison, Spring Lake Plantation, La.
Fed cotton-seed meal and hulls continuously.



A nice bunch of Duroc-Jersey hogs owned by T. C. Westbrook, Waco, Texas. These hogs are fattened upon equal parts of cotton-seed meal and corn, or cotton-seed meal and rice polish. While they are young and in a growing condition they graze on the river bank, the ditch banks and roadways that are fenced off for this purpose from the farms.



The Brazos River, the eastern boundary of a 2,000-acre farm owned by T. C. Westbrook, Waco, Texas. Mr. Westbrook feeds his Duroc-Jersey hogs cotton-seed meal and corn, or cotton-seed meal and rice polish. These hogs are permitted to graze along the banks of this river where they get plenty of water. A hog does not sweat (perspire), hence, if he does not have plenty of water to wallow in in the summer time he will probably die of heat. This is a common error erroneously attributed to his feeding.



A pen of cattle being fattened upon a ration of cotton-seed meal and hulls. In the picture will be seen many hogs fattening upon the waste from the cow troughs.



THE LARGE YORKSHIRE HOG.

The Yorkshire is an early maturing breed, rapid growers, and good grazers. Fed cotton-seed meal and hulls since farrowing. Property of Jo W. Allison, Spring Lake Plantation, Claiborne Parish, La.

A nice bunch of Duroc-Jersey hogs owned by T. C. Westbrook, Waco, Texas. These hogs are fattened upon equal parts of cotton-seed meal and corn, or cotton-seed meal and rice polish. While they are young and in a growing condition they graze on the river bank, the ditch banks and roadways that are fenced off for that purpose from the farms.





Chapter VI.

Mules, Horses and Oxen



Saddle bred stallion Gordon Chief, by Montgomery Chief, 4 years old. Has been fed almost exclusively on cottonseed meal and hulls since foaling. Property of Mr. Jo W. Allison, Spring Lake Plantation, Claiborne Parish, Louisiana.



*"John V. Blake,
Physician-surgeon.*

Floresville, Texas, Feb. 20, 1913.

*Dr. J. S. Abbott,
Austin, Texas.*

Dear Dr.:

In reply to yours of the 17th inst. will say that I have had a little experience in feeding cotton-seed meal to horses. I do so but am afraid that my experience will not be of much benefit to you. I have found that it is best fed to stock of any kind with other feed, and horses do extremely well on it if they are not given too big a ration at one time—it is always best to begin with a very small quantity and increase the amount until the proper amount is reached for each feeding, and twice each day is as often as I have ever fed mine. A horse that will eat the meal is almost sure to stay in a fine condition—the only trouble I have is preventing them from getting entirely too fat—the meal also keeps the hair fine and sleek and I have never seen any untoward symptoms from the use of the meal in my own stock and I have been feeding it for quite a number of years, not only to my horses but cows and hogs. I began feeding it to hogs in the fall of 1894 and I never saw a prettier bunch of hogs anywhere nor any that fattened as quickly as these did. I never feed it to hogs alone but mix it with corn chops ground very coarse and have the mixture thoroughly well moistened before allowing the hogs to begin eating, and where one is prepared to cook this mixture the hogs do much better than when fed in the raw state. Since the fall of 1894, when I began feeding cotton-seed meal, I have never lost an animal nor had one made sick from eating it. I never hesitate to feed it when I want to fatten an animal be it horse, cow or hog. I regret that I had not the time to procure a picture of my horses to send you but Mr. Murray can tell you that I keep a team in good condition and drive them as much as 12 miles an hour over our rough country roads.

Kindly let me know whenever I can be of any assistance to you in any way.

Yours fraternally,

John V. Blake."



Standard bred mares and their foals. Fed exclusively both before and after foaling on cotton-seed meal and hulls. Property of Jo W. Allison, Spring Lake Plantation, Claiborne Parish, Louisiana.



Additional Testimony.

At a meeting of the South Carolina Live Stock Association held at Columbia, S. C., February 8th and 9th, an address full of practical advice, backed by scientific knowledge was delivered by the eminent Dr. Tait Butler, of Raleigh, N. C., on "Practical Stock Feeding in the South." Dr. Butler is a recognized authority on feeds and feeding and what he says should have a special weight and influence throughout the entire South, and that part of his discussion touching the feeding of horses, mules and colts is of special importance to the Southern breeder.

"Dr. Butler: There is enough known about feeding horses cotton-seed meal for me to state that if you had a horse that you are feeding 14 pounds of corn daily, that you could take out four pounds of that corn and put in two pounds of cotton-seed meal and get better results. Not because corn is not the best feed we have for supplying heat and energy, but there is another thing needed. When that horse supplies you muscular energy he is burning up his muscles just as you burn coal in a furnace to supply energy to run the machinery in your factories, and he has got to have something to build up those wasted muscles, and corn does not contain it in sufficient quantity. A little cotton-seed meal is better than an additional amount of corn. When you are already feeding your horse stover and ten pounds of corn, *I would rather have two pounds of cotton-seed meal added than four pounds of corn.* I would rather have two pounds of *cotton-seed meal added than four pounds of oats.* Corn is a splendid horse feed, but we are wasting two million dollars a year in South Carolina feeding an all-corn ration."

A few of Mr. Westbrook's work teams going back to the cotton patch after a dinner of cotton-seed meal and corn. Mr. Westbrook feeds what he produces.



Choctaw Cotton Oil Company,
Shawnee, Okla.

"Shawnee, Oklahoma, Feb. 10, 1913.

Gentlemen:

We take pleasure in adding our testimonial to the value of cotton-seed meal and hulls as a horse and mule feed. We handle 1000 to 1500 head of mules each year and as you know, cotton-seed meal and hulls forms part of the daily ration of feed to our animals. We do not believe there is a more healthful food known today for horses and mules than cotton-seed meal. During the time we have fed cotton-seed meal and hulls our barn has been more free from disease than ever in the history of our business and our veterinary bill has been practically eliminated.

Yours truly, *Cofer & Critz."*



The above cut is a photograph of a colt 15 months of age, 15½ hands high, the property of Mr. F. M. Nix, Route 4, Hico, Texas, which has been fed two pounds of Cotton-seed meal per day since weaned, at the very moderate cost of three cents per day.

Mr. Nix advises that he is thoroughly convinced that Cotton-seed meal is by far the best and most economical feed on the market.

"James Island, South Car., July 30, '10.

Mr. Edw. A. Eve, Mgr. Sea Island Cotton Oil Co.

Dear Sir:

I have frequently used cotton-seed meal feeding my horses and mules, and always with perfect satisfaction. My attention was first called to its great value for that purpose some twenty years ago by Mr. John Stoney Porcher, then living in 'St. Johns,' who was pleased with his experiment with it and highly recommended it. It is too rich a food to be fed in a large quantity. My experience was that two or three pounds was about what was best. All do not take to it at once and have to be gradually accustomed to it by mixing with some food relish. I never feed it alone. Would like to see our farmers use it more generally as am confident a better acquaintance with it would cause a much higher appreciation of its value and economy.

Yours very truly,

(Signed) *W. G. Hinson,*
Leading Grower of Fancy Sea Island Cotton."



A few mules owned by W. Y. Foster, Hope, Arkansas, feeding upon a ration of cotton-seed meal and hulls at a cost of only 66 cents each per week.

United Oil Mills, Hope, Ark.
Gentlemen:

"Hope, Ark., Feb. 26, 1913.

Referring to your inquiry as to the experiments I have been carrying on for you and the success I have had with cotton-seed meal in the last several years, I take great pleasure in stating that I have never found any one article that the farmer produces which is of greater benefit to him than cotton-seed meal.

I have reduced my feed bill $33\frac{1}{3}\%$ by the use of cotton-seed meal, by mixing one quart or a quart and a half per day to my ear corn, which is a very simple and easy matter. During the winter when my stock is not working, I find that I can feed all of them on 75c. per day on cotton-seed meal and hulls.

By a test of the fertilizer I save around my barn yard and put on my field, I find that in competition with commercial fertilizers it is worth at least \$15.00 per ton which pays me handsomely for looking after it, and I can see results for three years. I also find that by taking the money I get for my cotton-seed and putting it back into cotton-seed meal and putting the meal under my corn as a fertilizer, that I can sometimes double my corn crop. By using this meal under my corn when I plant and a mixture of acid phosphate and potash for the second application, I do not believe that there is any better fertilizer at the price.

When the South realizes the gold mine they have in cotton-seed meal and the many usages it can be put to on the farm, I believe that the oil mills will pay us more for our cotton-seed because they can get more for the meal.

By experimenting with horses and mules when they are sickly and wormy, I find that cotton-seed meal nine times out of ten will correct this trouble. The same thing applies with hogs. Most hogs that are not healthy are wormy, and by giving them a rich slop of cotton-seed meal for a week or ten days and then follow with a mixture of cotton-seed meal and chops, it is wonderful to watch how rapidly the hogs will fatten.

From my experience I would say that cotton-seed meal today is the cheapest feed on the market.

Yours truly, B. M. Jones, An Arkansas Farmer."

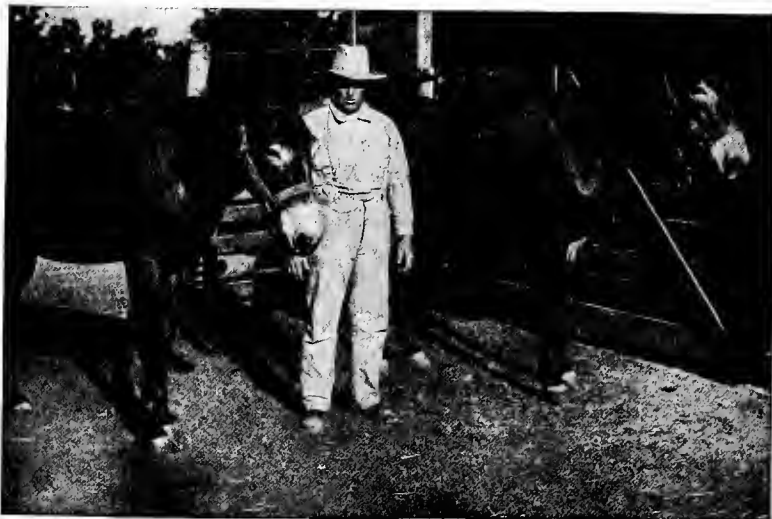


"Hope, Ark., Dec. 13, 1913.

United Oil Mills,
Hope, Ark.

Gentlemen:

Replying to your inquiry as to whether I ever fed horses and mules cotton-seed meal and hulls, will say that last winter I fed ten head of horses and mares, on cotton-seed meal and hulls alone. They ate no other feed, and I will say that it is the cheapest and best feed that you can give horses and mules. It is a good deal cheaper than corn, and the feed cost per horse less than a dollar per week. It is also a very healthful feed."—W. H. Briant.





"Hope, Ark., Dec. 12, 1913.

United Oil Mills,
Hope, Ark.

Gentlemen:

Referring to conversation held by your Mr. Bridewell and myself, regarding the feeding of cotton-seed meal and hulls to mules, will say that the mules I showed you have been fed cotton-seed meal and hulls for four years. I got to feeding this in Texas where corn was scarce and very high, and I found the cotton-seed meal and hulls have great feed value, and are a great deal cheaper than feeding corn.

As you could see my mules stay fat and healthy and I would recommend very highly to any of my farmer friends, to feed cotton-seed meal and hulls to mules, for I know from experience it is a good feed for horses, mules and cattle and you can feed them for \$1.00 per week on meal and hulls."

T. J. Walker, R. F. D. No. 6.

"Let us give, in a word, my experience, rather than my views and conclusions, on the horse feed problem: Several years ago, when I was a cotton-seed crusher, on a small scale (I am not now even remotely connected with that worthy calling) it was at certain times better to do anything with meal than to sell it. There came into my family unexpectedly two colts. Just like a baby is never wanted until it comes, and then immediately the household goes crazy over it, just so I took on about my colts. At that time oats were about \$36 per ton, and corn about \$26. I began feeding my mares on these expensive grains ground with a little cotton-seed meal dusted in. They took to it all right, and before the colts were six weeks old they were nibbling at their mother's feed. Since, more colts have come. The oldest, now five years old, and none of them have ever passed a day in their lives without eating some cotton-seed meal. They have never been out of fix. The older ones weigh 1100 pounds and are 16 hands high—decidedly larger than dams or sire. They have carried me fifty miles a day without breathing deep.

Here is a clean-cut, decisive example of cotton-seed meal as a component part of a horse's ration."

Henry C. Hammond, Augusta, Ga., June 20, 1907.



A shetland pony owned by Hy. Russek which has always been fed upon a ration of cotton-seed meal and hulls and has always been in the best of health.

"Shawnee, Okla., Feb. 10, 1913.

*Choctaw Cotton Oil Co.,
Shawnee, Oklahoma.*

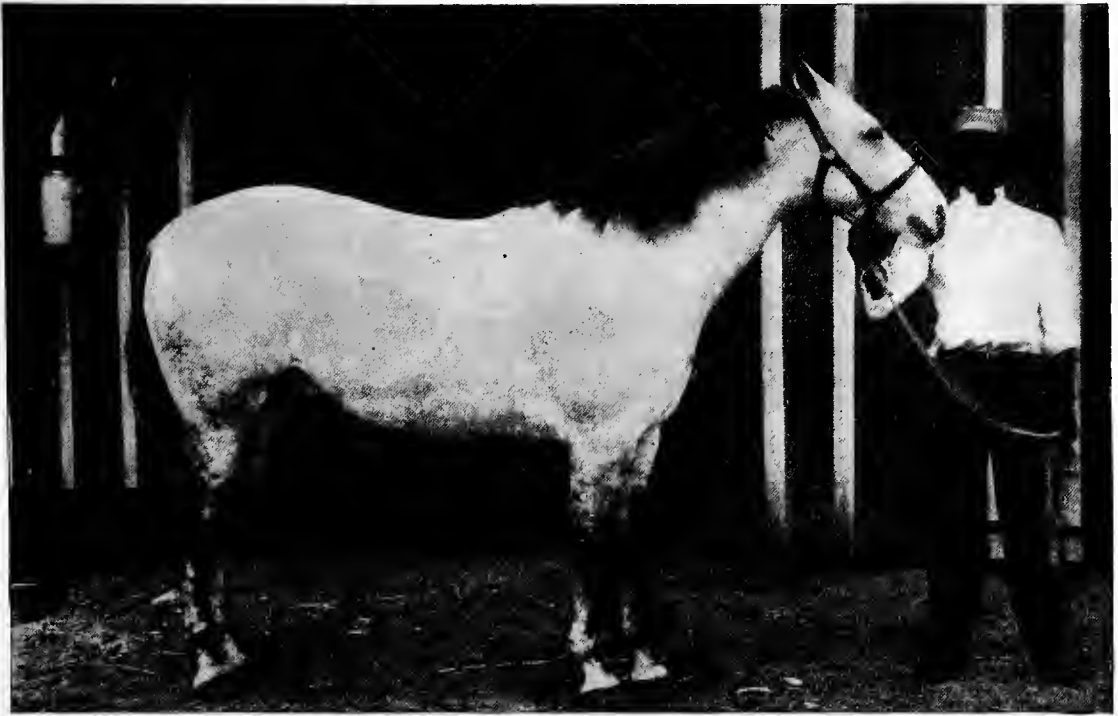
Gentlemen:

Replying to your favor of this date, beg to advise that we have been feeding cotton-seed meal and hulls in connection with other feed stuffs, to our horses and mules for more than two years. We are very much pleased with results and take pleasure in saying that during the time we have been using meal as a ration, we have not had a mule with the distemper nor one that has been foundered. We consider it a very valuable feed stuff for any class of live stock. As you are aware, we handle 1500 to 2500 head of mules per year.

Yours truly,

C. P. Jackson."





A work horse owned by Russek Bros., Schullenburg, Texas, which has been fed on a diet of cotton-seed meal and hulls for 2 years.

"Beatrice, Ala., Nov. 20, 1902.

*Alabama Cotton Oil Co.,
Mobile, Ala.*

Gentlemen:

Replying to your favor of recent date with regard to results of using cotton-seed hulls and meal as feed for cattle will say that it has given better satisfaction than any feed I have ever used. Regarding the report that feeding hulls and meal to cattle causes blindness wish to state that none of mine have ever gone blind and I have used this feed for past seven years. I will add furthermore that most of the blindness in cattle is caused by the whip. I am working 100 head here and there is not a blind ox in the bunch, though they are fed entirely on cotton-seed meal and hulls and are worked hard every day hauling logs.

I have some oxen that have been working six years on meal and hulls and are among the best cattle I own today. Large steers require about 25 pounds of hulls and 5 pounds of meal per day. As a result of feeding on above plan, all my cattle are in first-class condition.

Any further information you may desire regarding this subject will be given with pleasure.

Yours truly,

(Signed) G. Talley."



The above is a photograph of a bunch of mares and colts, the property of Mr. Albert Jamerson, Route 2, Iredell, Texas, which Mr. Jamerson has raised on cotton-seed cracks, feeding them 100 days during the fall and winter at the rate of two pounds per day each. He finds this to be the most economical feed on the market.



T. C. Westbrook, Waco, Texas, building a levee to protect one of his farms in the Brazos bottom. These mules eat cotton-seed meal and corn, about equal portions, and all the hay they want.



GOLDEN GLEAM—By Chester Time (a son of the famous Chester Dare 10). This filly was foaled March 29, 1912, weaned August 1, and has been fed on cotton-seed meal every day since. She was a blue ribbon winner at the Dallas Fair, October, 1912. Above picture was taken February 16, 1913. Respectfully,
Dallas, Feb. 20, 1913. W. I. Yopp.



"Whitesboro, Texas, March 4, 1913.

*S. R. Cockrill, Mgr.,
Whitesboro Cotton Oil Co.,
Whitesboro, Texas.*

Dear Sir:

Complying with your request as to my experience in feeding young mules cotton-seed meal and hulls, I wish to say that I have for the past five years been feeding this product and find it to be excellent feed and not at all expensive. In feeding mule colts, I mix four hundred pounds of meal with one ton of hulls and after the mules become used to it, I feed them about six to eight pounds daily and what wheat straw they will eat. This ration will keep them in fine growing condition and when put on the grass will soon get fat. I also give this feed in the latter part of summer and early fall when the pasture gets dry and keep them growing. I have never had the least trouble with this feed. I am

Very truly,

J. M. Buchanan."



This is a photograph of a pen of mules and horses feeding upon cotton-seed meal and hulls. These animals are the property of Mr. A. D. Turner, Denton, Texas. Mr. Turner is seen standing on the right and Mr. Tom Johnson in the middle of this picture. These gentlemen have, as partners, handled fifteen or twenty thousand head of mules and horses in the last twenty-five years. They have never fed anything but cotton-seed meal and hulls to such animals.



"Shawnee, Oklahoma, Feb. 10, 1913.

Choctaw Cotton Oil Co.,

Shawnee, Oklahoma.

Gentlemen:

Replying to your inquiry, we take pleasure in endorsing meal and hulls as a ration for horses and mules. We handle 2000 to 3000 head of mules each season and we take pleasure in certifying that we have never had a sick mule when we have had them on a ration of cotton-seed meal mixed with other feed stuffs.

Yours truly,

Fibus & Gaskill."



The use of the foregoing tables of "Standard and Average Composition of Feeding Stuffs," is illustrated in the following table. Most of the rations on which computations have been made are suggested or are similar to those suggested by the Georgia experiment station and other authorities.

It is rarely possible or even desirable to exactly duplicate the analysis given by the standards, but for any given condition it is a paying proposition to try to approximate it. When the nutritive ratio of a given feed varies from the standard much more than one unit, it is very probable that a more efficient and more economical ration could be suggested by careful comparison of feeds available and prices.

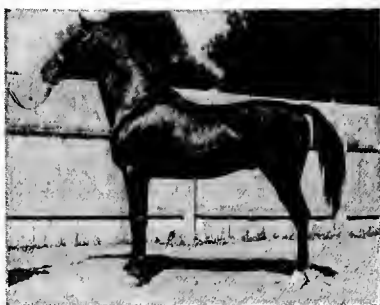
One ration for each kind of work has been included which is especially far off in nutritive ratio purposely to show how easily our common rations may be off. It is often very simple and very easy to balance up such a ration. Cotton-seed meal is so reasonable in price and easily obtained that there is little excuse for feeding a ration low in protein, and there are so many kinds of roughness and concentrated feeds high in carbohydrates that one cannot afford to err on the other side and feed too large a proportion of protein.

While the rations in the table are all for horses, all that has been said applies equally well to other domestic animals, and a similar table could be gotten up for each. The best proposition is, however, to work out each individual case knowing all conditions and prices and taking these into account.

THE FORT WORTH LABORATORIES,

Per F. B. Porter, Pres.

	Light Work				Medium Work				Heavy Work					
	Standard	25	24	20	22	19.6	24	29	28	26	28	26	28	Standard
Wheat Bran .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oats .....	.....	4	2	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cotton Seed Meal .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rice Bran .....	.....	.....	2	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corn .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corn and Cob Meal .....	.....	.....	5	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cow Pea Hay .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rice Straw .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corn Stover .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cotton Seed Hulls .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Johnson Grass Hay .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Timothy Hay .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corn Fodder Leaves .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Alfalfa .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total Weight .....	.....	25	24	20	22	19.6	24	29	28	26	28	26	28	.....
Pounds Total Dry Matter	20	22	21.2	17.3	19.6	17.3	24	23.5	23.3	23	24.9	26	26	.....
Pounds Digestible Protein	1.5	1.87	1.48	1.37	1.73	1.37	2	2.29	1.8	1.66	1.75	2.5	2.53	.....
Pounds Digestible Carbohydrates	9.5	12.65	8.28	9.83	10.61	10.61	11	13.3	8.94	9.23	13.9	13.3	14.89	.....
Pounds Digestible Fat	0.5	0.74	0.44	0.41	0.60	0.60	0.6	0.78	0.98	0.53	0.78	0.8	1	.....
Nutritive Ratio	7	7.1	6.3	7.8	6.9	6.9	6.2	6.6	6.2	6.3	8.9	6	7	.....



Ration for Feeding Mules.

Successful ration used by J. M. Buchanan, Whitesboro, Texas:

	By weight
Cotton-seed meal	400 pounds
Cotton-seed hulls	2000 pounds

Thoroughly mixed and from 6 to 8 pounds of mixture fed daily to each mule, with as much wheat straw as they will eat.

Daily Ration for Growing Horses.

Amount for 1000 lbs. Live Weight.

Ration No. 1:

10 lbs. Corn.
2½ lbs. Cotton-seed meal.
12 lbs. Prairie hay.

Ration No. 2:

2 lbs. Cotton-seed meal.
14 lbs. Sorghum hay.
4 lbs. Corn.
6 lbs. Wheat bran.

Daily Ration for Horses Working.

Amount for 1000 lbs. Live Weight.

Ration No. 1:

8 lbs. Corn.
3 lbs. Cotton-seed meal.
12 lbs. Prairie hay.

Ration No. 3:

12 lbs. Corn.
2 lbs. Cotton-seed meal.
12 lbs. Prairie hay.

Ration No. 2:

6 lbs. Oats.
3 lbs. Cotton-seed meal.
12 lbs. Hay.

Ration No. 4:

8 lbs. Rice bran.
4 lbs. Molasses.
2½ lbs. Cotton-seed meal.
12 lbs. Prairie hay.

Feeding Work Oxen.

Successful ration used by G. Talley, Beatrice, Alabama:

	By weight
Cotton-seed meal	5 pounds
Cotton-seed hulls	25 pounds



Chapter VII.

Fattening Show Cattle and Sheep





This is a photograph of "Druid" of Point Comfort, Grand Champion Bull, owned by Lee Bros., of San Angelo, Texas. Cotton-seed meal has always been a part of his daily ration.

Fattening Thoroughbred Herefords For Fat Stock Shows.

THE pen fattening of range cattle, scrubs, and mixed breeds generally for market upon cotton-seed meal and hulls is a matter of such common knowledge among every class of people in the South that our people have come to think this is all such feed is good for. The public generally does not know that cotton-seed meal and hulls form all or a part of the ration of thoroughbred cattle feeding throughout the Country.

Lee Brothers, San Angelo, Texas, are breeders of thoroughbred Herefords. At present, they have over 300 registered Herefords in their herd.

The cut shows one of their animals, Druid of Point Comfort, Grand Champion bull over all ages, 1908, 1909, 1910, 1911, 1912. Lee Brothers are proud of this animal of course. Cotton-seed meal has always been a constituent element of his ration. He is kept in pretty good order all the year, in fact he is fat all the time. His ration varies with the season of the year and with the price of feed. In January, 1913, his ration, and the ration of the rest of the herd, is composed of cotton-seed meal, wheat bran, Johnson grass ensilage, corn chops, and milo maize chops in the following proportions:

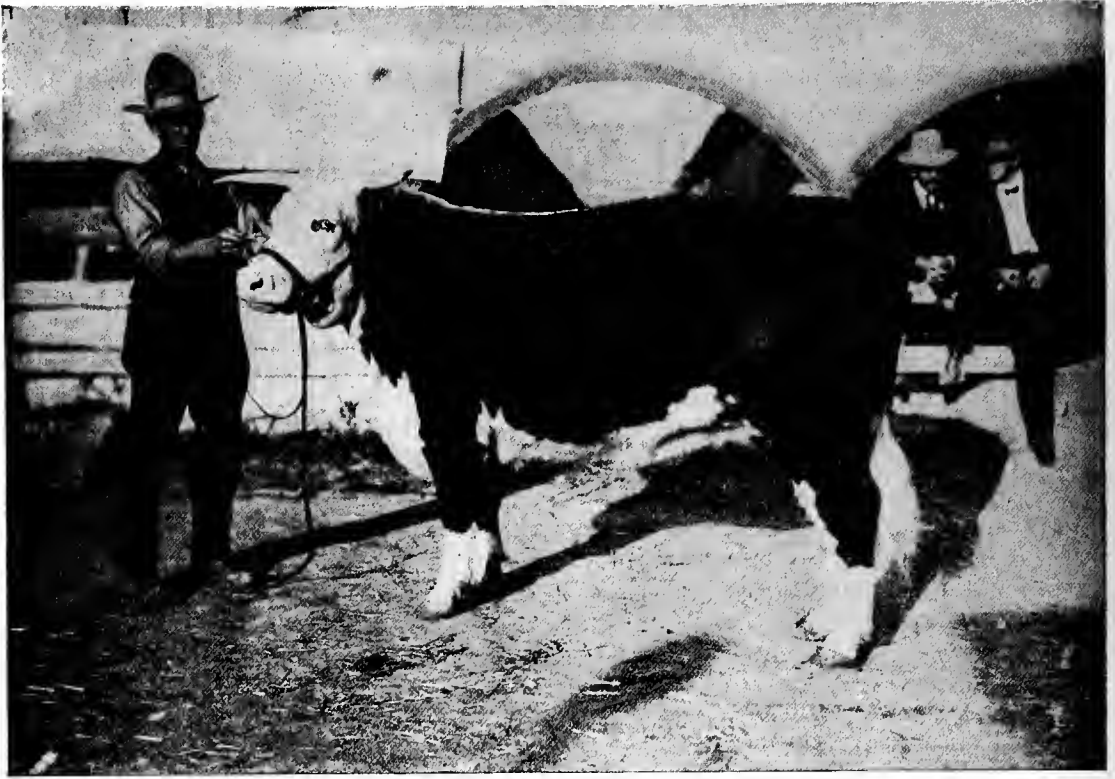
Ration.	Digestible	
	Protein.	Fat and Carbohydrate.
100 lbs. cotton seed meal.....	37.2	44.4
200 " milo maize	14	126.2
100 " wheat bran	12.2	45.3
400 " corn chops	24.8	292.4
100 " Johnson grass ensilage probably..	3.3	51
Total	91.5	559.3

The nutritive ratio of this ration is about 1 to 6 or 1 to 7. 100 pounds of cotton-seed meal could be substituted for 100 pounds corn chops. It would not then be necessary to feed as many pounds per day to each animal, as it is with the above ration. Lee Bros., like all other scientific feeders, produce a large part of their feed. They buy the concentrates which they need if it is not profitable to produce it.

A picture of another one of Lee Bros.' prize winners is also shown. It is a grade Hereford steer raised, fattened, and *kept fat* upon a ration of cotton-seed meal, milo maize, corn chops, bran and ensilage.

The value of ensilage as expressed by Phil Lee is, "*ensilage gives the animal a good appetite.*"

Herein is a recognition of a most important physiological principle. Food cannot be absorbed and assimilated by animal tissues until after it has been digested. It cannot be well digested unless the digestive glands produce an abundant quantity of potent digestive fluids. Medical men of all ages have striven to restore the appetite of their patients, but not until recently has physiology explained the precise value of a good appetite. Professor



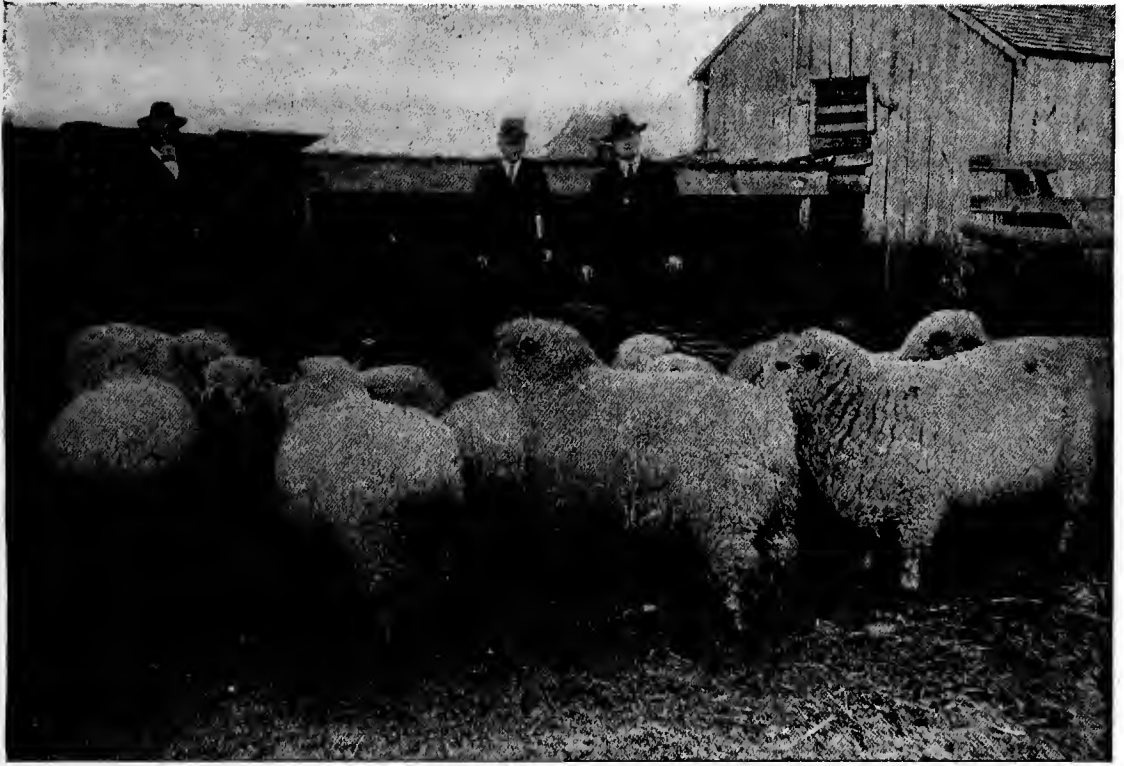
This is a photograph of a two year old grade steer owned by Lee Bros., San Angelo, Texas.
This is a blue ribbon steer that has always eaten cotton-seed meal.

Pavlov, already referred to in the preceding division of this booklet, in his research work on the "Digestive Glands,"—the salivary glands, gastric glands, the pancreas, the intestines, and the liver—tried to find out how to stimulate these digestive organs. After several years of this work, he said,

"The appetite, as has been repeated many times in these lectures, is the strongest of all stimuli to the digestive glands."

Whatever may be said of ensilage—its feeding value, its cost, and the like—its most important function is in giving to the animal this "*appetite juice*," this "igniting fluid" we call *appetite*.

This grade Hereford and this grand champion bull before mentioned are fed cotton-seed meal every day in the year. They are as fat as mud all the time, and they don't have to be rushed to market at the end of a ninety day fattening period before some digestive disturbance takes place. They have been raised upon cotton-seed meal and other concentrated feeding stuffs. Their body cells are accustomed to such food, and are organized for the proper handling of such concentrates. Since cotton-seed meal contains such a high percent. of protein, which is essential to the production of muscle, bone, nerve tissue, skin, hair, connective tissue, and ligaments—the framework of an animal—it is no wonder that so many prize winners are made of those animals that eat it all of their lives.



Upper row from left to right, A. D. Turner, Denton, Texas, breeder of thorough-bred Shropshire sheep; J. S. Abbott, Food and Drug Commissioner of Texas; Tom Johnson, President, First National Bank, Denton, Texas.

Lower row, imported Shropshire rams and ewes. These thorough-bred sheep are fed exclusively upon cotton-seed meal and hulls.

Feeding Sheep Cotton-Seed Meal and Hulls

One of the best known breeders of thoroughbred sheep in Texas is A. D. Turner, of Denton, Texas. Some of the ribbons, red and blue, are shown, representing the numerous prizes received by Mr. Turner on sheep shown at many places in the United States. Some sheep that are being fattened on cotton-seed meal and hulls alone for the Fat Stock Show held in Ft. Worth, Texas, in March, 1913, are also shown.

At the State Fair of Texas in 1912, Mr. Turner got \$91.00 of the \$100.00 offered as prize money in the sheep department. The other \$9.00 was taken by a man to whom Mr. Turner had sold sheep. He has never fed his sheep anything but cotton-seed meal and hulls. He has 1,200 acres of land, a part of which is used for pasture. But the sheep are fed during the winter, and fattened for show purposes entirely upon cotton-seed meal and hulls. If a man who imports the finest sheep offered for sale, breeds them for breeding purposes, and never feeds anything but cotton-seed meal and hulls, there is certainly a good reason for it. Mr. Turner has been a sheep man in Denton County ever since the departure of the Red man from his trail up and down Denton creek. He has been a sheep man since the time the old settlers had



These are cuts of a few of the many ribbons that have been put upon the prize winning sheep owned by A. D. Turner, Denton, Texas. Mr. Turner has never fed his sheep anything but cotton-seed meal and hulls.

to do without lights at night, so the Indians could not find their houses. He has fed cotton-seed meal and hulls exclusively for twenty years to all sorts of farm live-stock and he has accumulated enough to live on quite comfortably from what he has made in the stock business.

The cut shows a few imported Shropshires which cost from \$100.00 to \$400.00 each. Their ration, like all the others, is cotton-seed meal and hulls. Another bunch being fattened for show purposes upon cotton-seed meal and hulls, is also shown.



A few mutton being fattened upon cotton-seed meal and hulls only, by Mr. A. D. Turner, Denton, Texas, who will show them at the Fat Stock Show in Ft. Worth, Texas, this spring.



Another bunch of thorough-bred sheep eating cotton-seed meal and hulls; the home of A. D. Turner, Denton, Texas.

"Denton, Texas, Feb. 15, 1913.

Hon. J. S. Abbott,

*Food and Drug Commissioner,
Austin, Texas.*

Dear Sir:

Replying to your recent letter asking for my experience in feeding cotton-seed meal and hulls I beg to say that I have been feeding cotton-seed meal and hulls to mules, horses, sheep, cattle, and hogs for about 25 years.

I wintered 75 head of mules and horses last winter on cotton-seed meal and hulls alone and they went through the winter in fine condition. They had a good appetite and a good sleek coat of hair all the winter.

I do not feed anything to my imported Shropshire sheep except a mixture of cotton-seed meal and hulls, and I have never seen any bad effects of this feed. Sheep fed upon this feeding ration will not shed their wool as they do when fed upon corn ration. This ration keeps the ewes in a good healthy condition and causes them to give a large flow of milk which gives the lambs a fine start.

I am sending you herewith some photographs of a few of the many ribbons that I have carried off from State and World's fairs in the showing of sheep that have never eaten anything but cotton-seed meal and hulls except what weeds and grass they could get around my place. Of the \$100.00 prize money offered by the Dallas-Texas State Fair last year, I received \$91.00 on prize winning sheep.

I have never had an animal of any kind to founder on cotton-seed meal.

Very truly yours,

A. D. TURNER."





"Denton, Texas, Feb. 15, 1913.

Hon. J. S. Abbott,
Food and Drug Commissioner,
Austin, Texas.

Dear Sir:

I have been feeding cotton-seed meal and hulls to horses, mules, and hogs for about 15 years. There is absolutely no other feed equal to this for keeping farm live stock in a good healthy growing condition with a good appetite and sleek hair.

I make a thin slop of the cotton-seed meal for hogs and give them from one-half to 2 lbs. of the meal per day. My hogs have always done well on this ration. They are allowed to graze, of course, and to have access to plenty of water. As the hog doesn't sweat he has to have something to keep him cool in the hot summer time.

Mr. A. D. Turner of this city and I have fattened thousands of sheep on cotton-seed meal and hulls and have never had any trouble in keeping them in a good thriving condition.

Yours truly,
W. T. Johnson."

"Based on the Chicago price for best feeding lambs plus 30 cents for shipping, the cost of grains was so high that only the lots fed corn, cotton-seed meal, clover hay and ensilage sold high enough to return any profit."—Bul. No. 16, Purdue University Agricultural Experiment Station, Lafayette, Ind.





Daily Ration for Growing Sheep.

Amount for 100 lbs. Live Weight.

Ration No. 1:

$\frac{3}{4}$ lb. Cottonseed meal.
3 lbs. Sorghum, prairie, alfalfa, or
cow-pea hay.

Ration No. 2:

1 lb. Corn.
 $\frac{1}{2}$ lb. Cotton-seed meal.
1 lb. Cow-pea hay.
1 lb. Sorghum hay.

Ration No. 3:

1 lb. Corn.
 $\frac{1}{2}$ lb. Wheat bran.
 $\frac{1}{2}$ lb. Cotton-seed meal.
 $1\frac{1}{2}$ lbs. Cotton-seed hulls.

Ration No. 4:

$1\frac{1}{2}$ lbs. Rice bran.
 $\frac{1}{2}$ lb. Cotton-seed meal.
 $1\frac{1}{2}$ lbs. Cow-pea hay.

Daily Ration for Fattening Sheep.

Amount for 100 lbs. Live Weight.

Ration No. 1:

1 lb. Cotton-seed meal.
3 lbs. Cotton-seed hulls.

Ration No. 2:

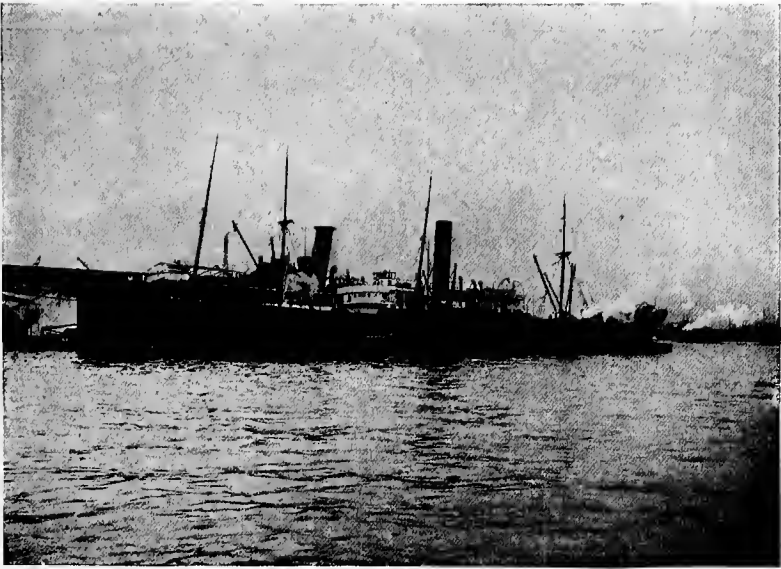
2 lbs. Corn.
 $\frac{1}{2}$ lb. Cotton-seed meal.
2 lbs. Cotton-seed hulls, sorghum hay,
cow-pea hay, or prairie hay.

Ration No. 3:

1 lb. Wheat bran.
 $\frac{3}{4}$ lb. Cotton-seed meal.
3 lbs. Cotton-seed hulls.

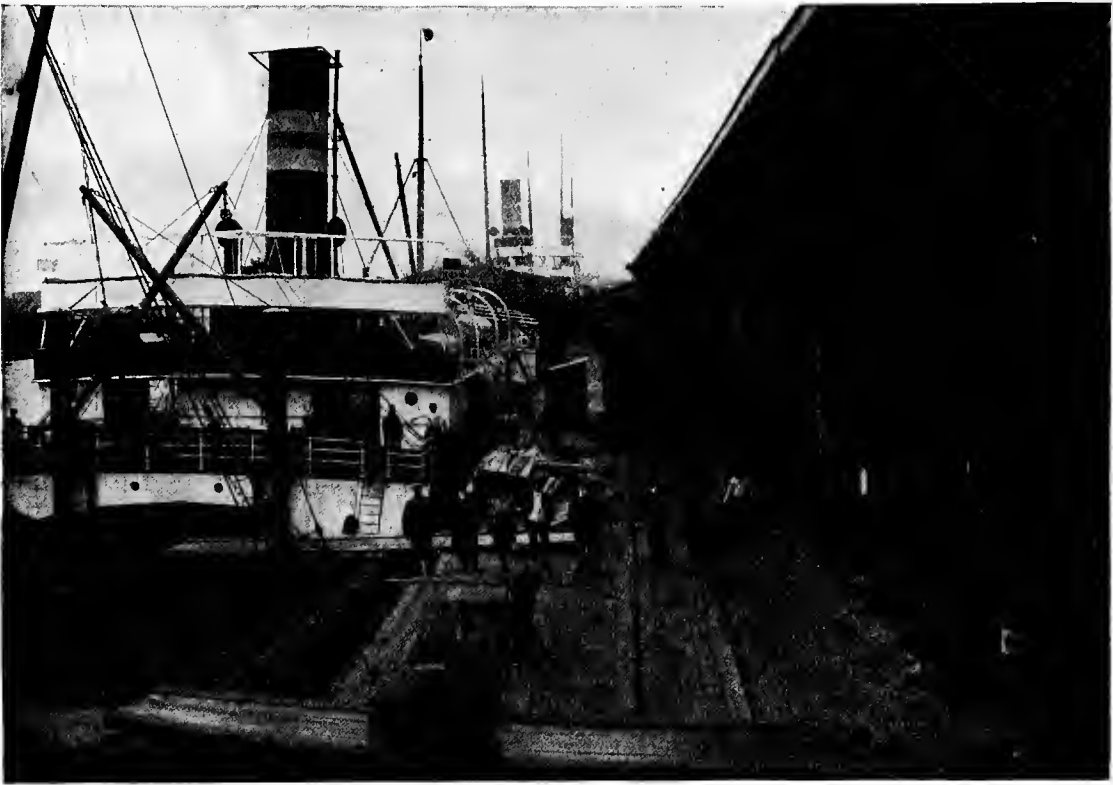






Chapter VIII.

The Export Trade in
Cotton-Seed Products



Port Arthur (Texas) cotton-seed cake sacking and grinding export dock of the Texas Export and Import Company of Galveston, Texas. Largest cotton-seed meal and cake export dock in the World. Steamers "*Rhodanthe*," "*Etonian*" and "*Sicilia*" loading simultaneously cotton-seed meal and cake. Season 1911-12.

The Export Trade in Cotton-Seed Products.

THIS trade has grown to such proportions as to almost equal the balance in trade between the United States and Europe. Our exports to Europe being larger than our imports about the value of the Cotton-seed Products we export, therefore, such products are an important factor in our foreign trade relations.

In the beginning of the Cotton-seed Product industry in the United States we had to depend upon the foreign markets entirely for the disposition of these products, but as the industry grew and the volume of such products made increased (as our cotton crop increased), they became so important, and the capital invested in their manufacture so large, that efforts were made to educate the people of our own country to the great value of such products that were being sent out of our country at less than their value.

While the amount and value of such products exported the past year was perhaps the largest in the history of the business, the amount of such products produced the past year grew to such proportions that the amount exported was not more than one-third of the amount produced. This emphasizes the great importance that the manufacturing of such products has grown to in this country, as well as the great importance that the trade in such products now occupies in our own country.

To further illustrate the importance that such products now occupy in our export trade and in our domestic trade as well, you have only to look at

the volume produced in this country the past year and the proportion of it exported and that consumed in this country.

The amount of cotton-seed oil produced the past year was approximately 3,500,000 barrels of fifty gallons each, and the amount exported was about 1,000,000 barrels, leaving for consumption in this country about 2,500,000 barrels. The amount of cotton-seed cake and meal produced the past year was approximately 2,000,000 tons of 2,000 pounds each and the amount exported was about 650,000 tons, leaving about 1,350,000 tons for consumption in this country.

There is scarcely any other single product the growth in volume of which has been so rapid, and the demand for which has so closely kept pace with its increased production as has cotton-seed products, and so important have they become, both in this country and Europe, that neither country could well get along without them.

All of which goes to show the great intrinsic merit of such products, as well as their importance in our export trade as well as to our domestic trade. They furnish feed for our stock, and food for mankind and beyond question are destined to continue and grow in importance as the people become educated to their merits, both as a pure and healthful food for mankind and as a highly concentrated and valuable feed for every kind of stock we raise.

The following tables show the amount and value of cotton-seed oil exported from the United States for several years past and to what countries it goes:

<i>Fiscal year</i>	<i>Pounds</i>	<i>Dollars</i>
1908.....	307,649,933	17,226,451
1909.....	383,154,968	20,851,380
1910.....	223,955,002	14,798,063
1911.....	225,520,944	17,127,369
1912.....	399,470,973	24,089,223

The distribution of the export in the fiscal year 1912 to principal countries was, stated in pounds, as follows:

<i>Exported to—</i>	<i>Pounds</i>
Netherlands	97,590,174
England	63,566,425
Italy	36,670,719
France	25,596,365
Canada	22,659,718
Mexico	28,961,136
Argentina	8,893,927



Loading of cotton-seed meal into barges under supervision of Goldstuck, Hainze & Co., Rotterdam.

The Cotton Seed Oil in Cuba

"Habana, Cuba, March 3, 1913.

"This commodity can be considered as a new one in the Cuban market, and ten years ago, very few people knew that from the cotton-seed an oil of positive nutritious results was obtained, and that with time it would come if not to eliminate the olive oil, at least to be its substitute.

"The cotton-seed oil importation, as a domestic matter, has greatly developed, having reduced the crude oil importation for soap making.

"Various are the packages and qualities of oil imported into Cuba, but the oil of greater demand is the 'winter yellow' which comes in cases of 4 tins of $22\frac{1}{2}$ pounds each and is used to replace the olive oil and many times to be mixed with it.

"The 'summer yellow oil' has not such a demand as the 'winter yellow oil' which is really not explainable. Since this is a warm country, where temperature never is under 71° F., the summer oil keeps perfectly well, clear and brilliant.

"Most of the oil that comes in barrels is employed in making compound lard. There is only one compound lard factory in this country which cannot supply all the demand, having the advantage on imported compounds, that our Custom House Tariff allows of a 25% reduction in duties on prime matters for making compound lard.

"There is a market, though very small, for white and yellow oils in barrels, specially for bakers.



Loading cotton-seed meal into barges under supervision of Goldstuck, Hainze & Co., Rotterdam.



Delivery of cotton-seed meal ex. warehouse into wagons under supervision of Goldstuck, Hainze & Co., Rotterdam.

"The compound lard consumption has been reduced in Cuba, due to low prices of pure lards, and having only a difference of 2 cents per pound in cost the buyer prefers the pure lard.

"The total consumption yearly in the whole island for cases and barrels is:

Cases	18,732
Barrels	9,376

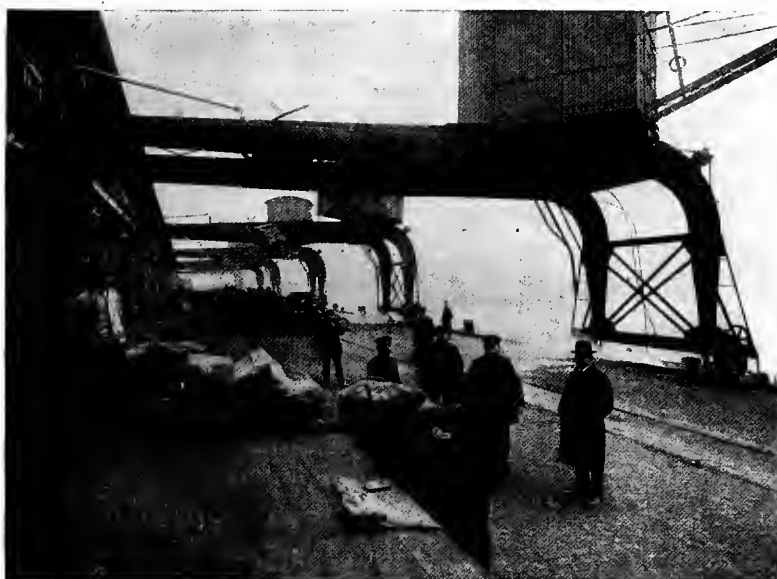
"The oil barrels are of about 52 gallons, and it can be said that only two or three factories work this market, and they are: Edible Products Co., American Cotton Oil Co., and Southern Cotton Oil Co.

"The other factories limit themselves to sell quantities of lard and oil. I think that if this market were better worked, approaching more to its Latin customs, a greater business could be obtained in cotton-seed oils and compound lard.

"The firms of that country that wish to work this market and want to know the way and uses of doing business here might address me through the Texas Cotton-Seed Crushers' Association or directly, and I will be pleased to inform them fully.

"The market can be also interested in cotton-seed fertilizers of 7 to 9% ammonia basis, and acid greases of 38 to 40% with 97% saponifiable prime crude oil and off-crude oil.

"Undeniable results of great commercial development by its own strength, this country is obtaining and, near to the United States, must make the merchants of that country to look to the advantages that would come to them by creating little by little the demand of all articles that Cuba needs."—A. MARCE.



Weighing on quay of cotton-seed cake under supervision of Golstuck, Hainze & Co., Hamburg.



Weighing, sampling and delivery alongside of cotton-seed meal under supervision of Goldstuck, Hainze & Co., Hamburg.

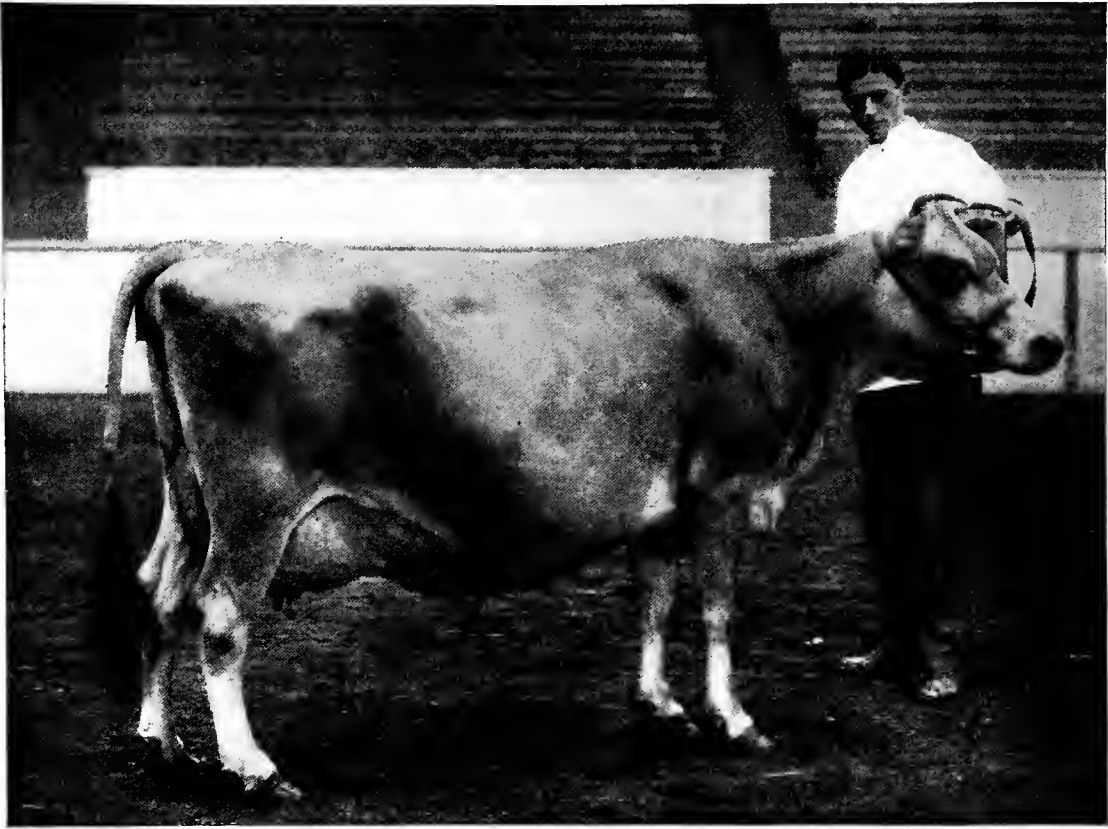


Weighing and sampling on quay of cotton-seed meal under supervision of Goldstuck, Hainze & Co., Hamburg.



Chapter IX.

Dairy Cows



"LASSIE."—Great Scott's Champion, 203703, on her sire's side a great grand-daughter of Golden Lad, through her sire Rhymer P. 2756 H. C., and her grand-sire, Great Scott, P. 2153 H. C., and on her dam's side a grand-daughter of Golden Lad, through her dam Tricycle 3rd P. 6295 C., owned by Ed. C. Lasater, Falfurrias, Texas. "Lassie's" ration, among other things, consists of five pounds of cold press cotton-seed cake.



Feeding Dairy Cows.

Every dairyman in reach of cotton-seed products, as is well known, uses more or less of cotton-seed meal and hulls for feeding dairy cows. Even as far North as Maine cotton-seed meal is very generally used, as is seen by the following letter to the Texas Dairy and Food Commissioner who made inquiry on this point:

"Maine Agricultural Experiment Station

Orono, Maine

Chas. D. Woods,
Director.

January 17, 1913.

Mr. J. S. Abbott,
Food and Drug Commissioner,
Austin, Texas.

Dear Mr. Abbott:

Your letter of January 11th is at hand. We have made direct experiments with the feeding of cotton-seed meal and cotton-seed hulls to live stock, horses, mules, chickens, hogs, etc. Of course you are aware that cotton-seed meal is largely used as part of the ration for dairy cattle in Maine, and it is used for that purpose successfully.

Yours truly,

CHAS. D. WOODS,

Director."

In many places dairy cows are fed upon meal and hulls all the year with no other feed to amount to anything scarcely. Such cattle remain in a good, healthy, thriving condition longer than upon any other single food product ration.

One of the most successful dairymen in Texas operating upon a small scale is Mr. A. E. Franklin, Austin, Texas. The figure shows Mr. Franklin's barn in which his cows are milked. Mr. Franklin is an enthusiastic feeder of cotton-seed meal and hulls. He mixes a little bran with the cotton-seed meal when he is feeding hay in place of hulls, because of the richness of the meal. Mr. Franklin is an enthusiastic friend of cotton-seed meal and hulls.



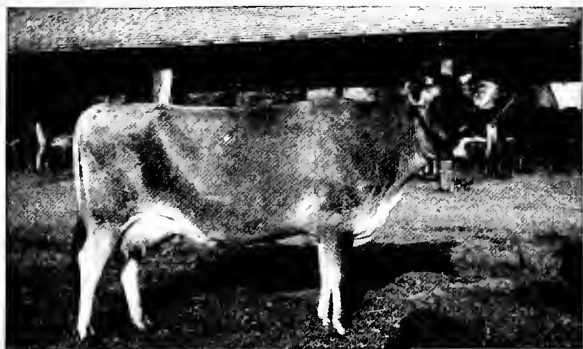
MR. A. E. FRANKLIN'S BARN, CONTAINING A WASH ROOM AND A MILK ROOM FOR MILKING COWS.

On the left side is a little boiler room which contains a \$35.00 boiler for making hot water and steam which is conveyed through pipes to the wash room on the left hand of the main barn. On the right hand of the main barn is where he milks his cows. It is well screened. This sanitary milk barn and wash room was built by Mr. Franklin himself at a cost of less than \$200.00. Mr. Franklin is milking seven thoroughbred Jersey cows and is selling his milk at 80 cents a gallon, which is just double the regular market price of milk. The seven cows are bringing him from \$450.00 to \$500.00 a month gross. The net earning is something over \$300.00 a month. These cows are fed upon a ration of cotton-seed hulls, meal and wheat bran.

Operating upon a much larger scale in the dairy business is the Falfurrias Jersey Dairy Company. Mr. Lasater owns nearly half a million acres of land, 19,000 cattle, 700 horse stock, and over 1,200 dairy cows, of which about 900 are registered Jerseys.

FALFURRIAS JERSEY DAIRY COMPANY,

Ed. C. Lasater, President,
Falfurrias (Brooks Co.), Texas.



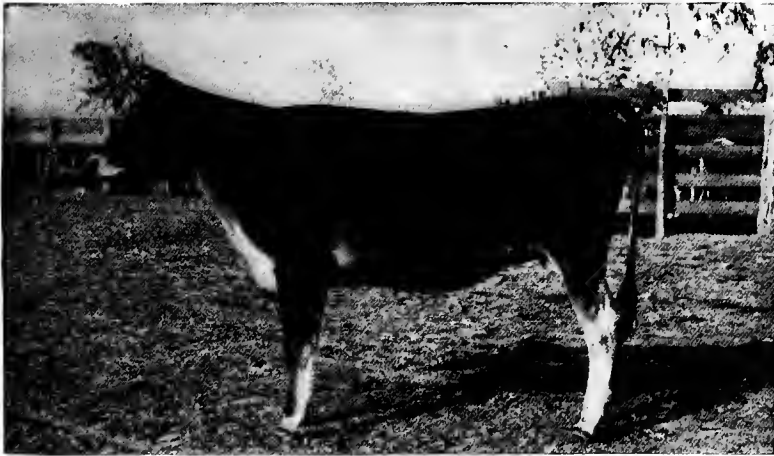
Prize winners owned by Ed. C. Lasater, Falfurrias, Texas. These thoroughbred Jerseys eat from five to six pounds of cotton-seed cold press cake daily.

In the fall of 1911, the Falfurrias Jersey enterprise was incorporated into what is now known as the "Falfurrias Jersey Dairy Company," with a paid-up capital of \$1,000,000.00.

Incorporated for the uses of the Falfurrias Jersey Dairy Company is forty thousand acres of land out of the Falfurrias Ranch. There are eight dairies now in operation on this proposition, they being so situated as to provide ample pasturage for the number of cattle each one is intended to carry. Seven of these dairies have a capacity of one hundred and twenty-five cows each, and the eighth, fifty cows. Each dairy has separate pastures for cows in milk and for dry cows. The outlying pastures being used for breeding young heifers, for calves when taken from the dairies, dry cows and bulls. Three of these dairies are operated with registered Jersey cows; the other five with high-graded Jersey cows. There are at present located on this property twenty-one silos, with an aggregate capacity of two thousand six hundred tons of ensilage; all of these silos have been filled with corn, kaffer corn, sorghum and pea vine ensilage this spring and summer. As many more will be built another year.

The Feeding Stuffs of this Dairy.

During the month of March, of 1912, milking an average of 738 cows per day, the average daily milk production per cow of this herd was 19.78 pounds, and the average daily butter production per cow, a fraction over one pound. These results being obtained by feeding a ration of six pounds of cold pressed cotton-seed cake, per cow, per day, at a cost of less than six cents, together with native pasturage. Beginning with February the weed crop, and subsequently the grass, keeps the cows in the best possible physical condition, and, at a very nominal feed cost, keeps the production up to a very satisfactory standard, and most certainly an economic one, until cold weather, usually November."



Another prize winner, owned by Ed. C. Lasater, Falfurrias, Texas. This thoroughbred Jersey eats from five to six pounds of cotton-seed cold press cake daily.

The following letter is self-explanatory:

*"ED. C. LASATER,
Falfurrias, Texas.*

February 15, 1913.

*Mr. J. S. Abbott,
Food and Dairy Commissioner,
Austin, Texas.*

Dear Sir:

Your favor of February 1st received. Mr. Lasater has only been at home two days since it was received and during that time was so busy he did not have the time to reply to it, but requested us to write you.

His views are that no concentrates can be fed to dairy cattle to better advantage than can cotton-seed cake and cotton-seed meal. We are feeding the cold pressed cotton-seed cake to our dairy cows now, in quantities up to five pounds per cow daily, according to amount of milk they are giving. This cold pressed cake contains forty per cent. of cotton-seed meal.

We have never experimented with our cows to see what feeds would produce the most milk, as we feed for economic production and not maximum production.

At the present time we are milking nine hundred cows, and making over eight hundred pounds of butter daily. This butter yield will increase to more than a thousand during the month of March. We feed nothing excepting the cold pressed cake, as above mentioned, and prickly pear during the winter months where we have it. Most of our dairies, however, have nothing excepting the cake and the pastures. We also feed the cake to the calves as soon as they will eat it; they seem to relish it, and we find that they do splendidly on a small amount of it.

We regret that Mr. Lasater could not have had the time to give you his views in a personal letter, but trust that the information contained herein will be of some value to you, we are,

Yours very truly,

Ed. C. Lasater Office,

By A. B. Jones."



Dairy barn and silos, owned by Ed. C. Lasater, Falfurrias, Texas, in the land of sunshine, "The Land of Heart's Delight." The dairy barn is built so as to admit plenty of air. The cow animal, as well as the man animal, needs canned vegetables during the winter months. Hence, the Silo.

"I am in receipt of your letter of August 26 by your Manager to Dean F. B. Mumford. We have been making use of cotton-seed meal in feeding our dairy herd for 10-12 years and feed it regularly in sufficient quantities to properly balance the ration.

When talking to Farmers' Institutes and other gatherings I have repeatedly urged farmers to use cotton-seed meal for their dairy cows. The typical ration fed to the Missouri cow consists of corn, corn stover, and timothy hay which is capable of producing only a limited amount of milk. The addition of 2 pounds cotton-seed meal per day to this increases the milk-making capacity about 50% or more. We should be entirely willing to give our opinion regarding the value and economy of feeding cotton-seed meal to anyone who may wish our opinion concerning it."—C. H. Eckles, Prof. Dairy Husbandry, University of Missouri, Columbia, Mo.

"The phenomenally high melting point of butter from cotton-seed" was first pointed out, I believe, by Prof. H. H. Harrington and Dr. H. W. Wiley.

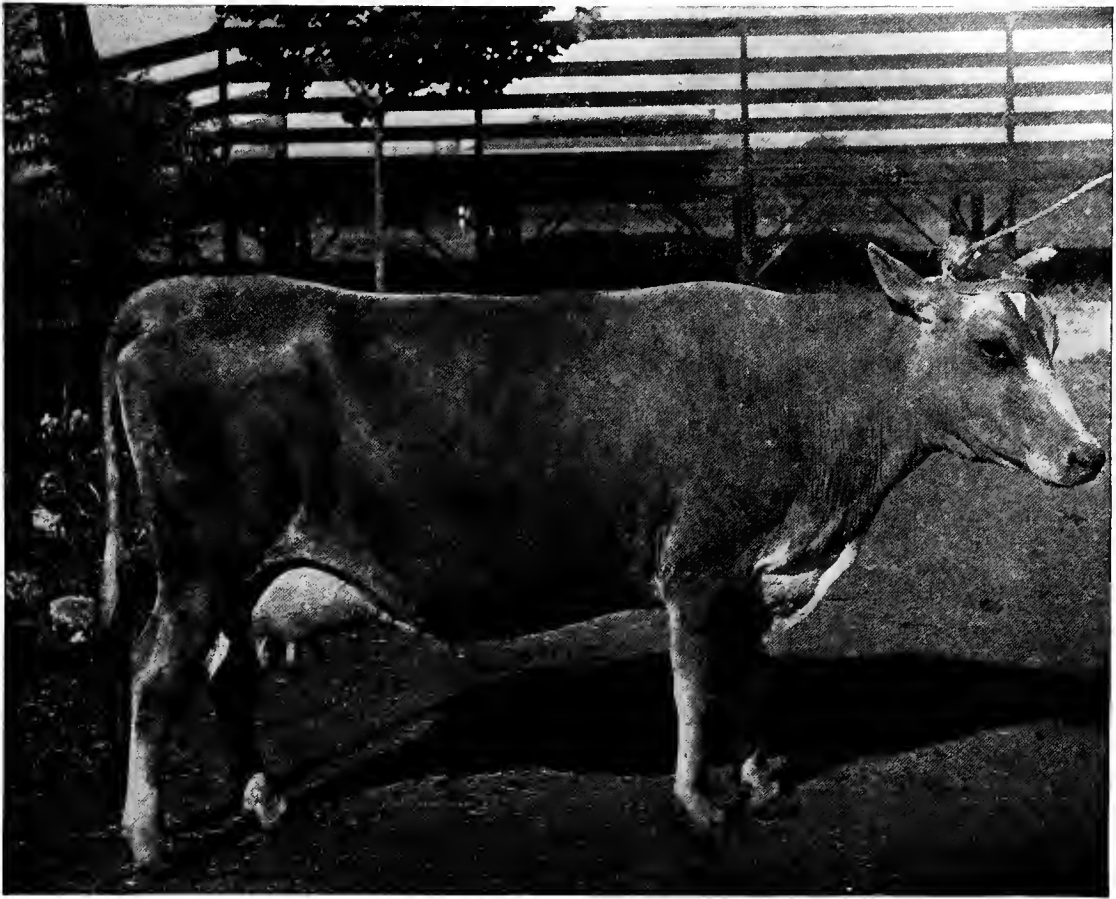
"It has since been further confirmed at the Texas Agricultural Experimental Station and by the Alabama Agricultural Experiment Station.

The practical effect of all this must be found, if at all, in the increased firmness of the butter for handling and shipping in hot weather."—The Pennsylvania State College Agricultural Experiment Station, State College, Pa., Bul. No. 17.

"FEEDING VALUES OF COTTON-SEED and Linseed Meals. Twenty cows were fed for nearly six months. Cotton-seed meal seemed to possess a small though measurable advantage over linseed meal as a milk and butter-making by-product; and since it cost less and carried a greater plant food content, it proved economically preferable."—Bul. 137, Vermont Agricultural Experiment Station, Burlington, Vt.

"Protein is the necessary ingredient for practically all farmers and dairymen to purchase.

"The prices paid for cattle feeds bear very little relation to their feeding value. The price is so much per ton whether it is rich in protein and well suited to supplement the ordinary farm feeds, or whether it be a feed rich in starch and of less value in compounding rations."—Serial No. 48, Bul. Georgia Dept. of Agriculture.



"In these trials cotton-seed meal, even the relatively poor grade fed, won out handily as compared with linseed meal. Yet the writer believes that the latter is an advisable concomitant to use with cotton-seed, because of its laxative properties.

COTTON-SEED MEAL, as compared with linseed meal, seemed to possess a small though measurable advantage as a milk and butter-making by-product; and since it cost less and carried a greater plant food content, it proved economically preferable."—Bulletin 119, Vermont Agricultural Experiment Station, Burlington, Vt.

"After the calf is one week old, it should be given some grain to teach it to eat as soon as possible. A mixture of wheat bran, ground oats and oil-meal in equal parts will be found excellent for producing growth, and bulky enough to start the development of the paunch."—Bulletin 63, Storrs Agricultural Experiment Station, Storrs, Conn.

"One pound of cotton-seed meal was found to be equal to nearly two pounds of cocoanut meal for milk production."—Bulletin 99, Florida Agricultural Experiment Station.



Has Fed it for Fifteen Years.

Mr. J. M. Watson, pioneer feeder of Hamilton County, Kansas, says:

"March 25, 1913.

*H. G. Cherry, Mgr.,
Kansas City, Mo.*

Dear Sir:

I have used cotton-seed cake for fifteen years and can say that it is the best and cheapest feed I ever used for cattle, also for milch cows and calves."



This is a photograph of Rezellman, a Holstein cow owned by F. B. Hale, Osceola, Arkansas, who bought her from Mrs. Fullerton of Cape Girardeau, Mo., who imported her from Holland. She gave from 8 to 10 gallons of milk per day upon a ration of cotton-seed meal and hulls.

"These were the finest cows I ever saw, and every person that did see them said they were fine and very fine, and it was all brought about just by feeding them cotton-seed meal and hulls. Try it. Get you a good blooded cow and feed her meal and hulls and just keep feeding it and you will find it to be the best feed for cattle, hogs, mules and horses you ever fed."—F. B. Hale, Osceola, Ark., March 4, 1913.

"Whitesboro, Texas, Feb. 27, 1913.

*Mr. S. R. Cockrill, Mgr.,
Whitesboro Cotton Oil Company,
Whitesboro, Texas.*

Dear Sir:

In regard to feeding hulls and meal to stock, I have been feeding meal to my hogs for a number of years, and have fed hulls and meal to cattle for the past five or six years, and with the best results at all times. I have two milk cows four years old, which have been fed meal and hulls twice a day since they were weaned. I have fattened numbers of cattle of all kinds on hulls and meal.

*Yours truly,
M. V. Scheid."*

Calf Feeding.

Successful ration used by Connecticut
Agricultural Experiment Station:

By weight

- Wheat Bran 1 part
- Ground Oats 1 part
- Oil meal 1 part



Daily Ration for a Dairy Cow.

Ration No. 1:

- 35 lbs. Silage.
- 12 lbs. Mixed hay.
- 2 lbs. Wheat bran.
- 2 lbs. Corn meal.
- 4 lbs. Cotton-seed meal.

Ration No. 2:

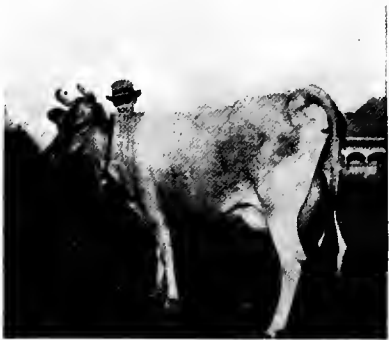
- 3 lbs. Cotton-seed meal.
- 3 lbs. Wheat bran.
- 15 lbs. Cotton-seed hulls.

Ration No. 3:

- 3 lbs. Cotton-seed meal.
- 6 lbs. Sweet potatoes.
- 12 lbs. Mixed hay or cotton-seed hulls.
- 7 lbs. Blackstrap Molasses.

Ration No. 4:

- 6 lbs. Beet pulp.
- 3 lbs. Corn and cob meal.
- 3 lbs. Cotton-seed meal.
- 12 lbs. Cotton-seed hulls or hay.



Butter.

To Increase Its Quality and Quantity.

Heat a quantity of *good deodorized cooking cotton-seed oil* to about blood heat, and just before beginning to churn, add to the milk, using about one-third of a teacupful to each gallon of milk, and proceed as usual.

Good cooking oil can be bought from any progressive grocer at about sixty cents or less per gallon, which is about eight cents per pound.

A three-gallon churning of rich milk will take about half a pound of oil. It will hasten the coming of butter, assist in its better collection, improve the quality of both it and the buttermilk, and being returned as butter will give the better collection of the butter fat an increased yield slightly in excess of the weight of the selling price of the butter and the cost price of the oil. But this is by no means the major advantage of the practice. This is to be found in the decreased time and labor in churning and in the improved flavor and softened texture of the butter and buttermilk.





Chapter X.

Cotton-Seed Flour

Cotton-Seed Flour

The Sunny South's Substitute for Meat.

UNTIL recent years man has been dependent upon corn, rice, wheat, oats, buck-wheat and potatoes for the division of food nutrients known as *carbohydrates* (starches and sugars chiefly). Turnips, cabbage, cauliflower, lettuce, spinach, and other "vegetables" have furnished a part of carbohydrates called fiber. We have depended upon the sheep, the ox, and the hog for both *protein* and *fat*.

Cotton-seed oil now furnishes the world with a large per cent. of *fat*, having taken the place of *tallow* and *lard* for cooking purposes and for butter.

Cotton-seed flour being rich in protein like lean meat may take, in part at least, the place of meat without doing violence to a balanced ration of *protein*, *fat* and *carbohydrates*. This flour is easily digested, as shown from the following table of the digestibility of food nutrients of cotton-seed flour, wheat flour, corn meal and meat:

Average Digestibility of Food Nutrients.

	<i>Protein</i>	<i>Fat</i>	<i>Nitrogen-free Extract</i>
Cotton-seed meal	88.4	93.3	60.6
Corn meal	67.9	92.1	94.6
Wheat flour	93.9	90.	99.1
Meat	97.	98.	98.

Cotton-seed flour contains no *starch*, and is therefore a valuable food for diabetic patients. It contains half as much fat as fresh meats and does not, therefore, produce as much animal heat as meat. This is a point worthy of notice in hot climates.

Broadly speaking, the nutritive value of any food is measured by the amount of protein, fat and carbohydrates contained in it. The most valuable of these is protein, the nitrogen-containing albumen-like substance, similar in character to the white of an egg, and supplying to the system growth, development, muscle, bone and lean meat. Next in value is fat, producing heat and energy and building up fat in the body but making no muscle or flesh. Under the general term carbohydrates is classed the starch, sugars and fibers present in all foods, forming the cheapest and most abundant of food elements, giving some heat and energy, but making no flesh, bone, or muscle and in general estimates of food value, frequently neglected.



Keeping these facts in mind and as indicating the wonderfully nutritive value of cotton-seed flour, the following tabulation is interesting as showing the

PROTEIN AND FAT CONTENTS
of some Articles of Food of Every-Day Consumption
as compared with
COTTON-SEED FLOUR

	<i>Protein</i>	<i>Fat</i>	<i>Total</i>
Allison's cotton-seed flour.....	53.90	7.17	61.07
Patent wheat flour.....	10.68	1.05	11.73
Graham wheat flour.....	12.44	1.90	14.34
Corn meal	9.17	1.77	12.94
Lima beans (dried).....	18.1	1.5	19.6
Navy beans (dried).....	22.5	1.8	24.3
Cow peas (dried).....	24.4	1.4	25.8
Garden peas (dried).....	24.6	1.0	25.6
Irish potatoes	2.2	1.0	3.2
Sweet potatoes	1.8	0.7	2.5
Fresh eggs	13.4	10.5	23.9
Whole milk	3.4	4.0	7.4
Dried figs	4.3	3.0	7.3
Dried prunes	2.1	0.0	2.1
Raisins	2.6	3.3	5.9
Lean round of beef as bought.....	19.5	7.3	26.8
Wheat	12.5	2.2	14.7
Corn	9.9	2.8	12.7
Oats	11.8	5.0	16.8
Rice	7.4	0.4	7.8
Rye	10.6	1.7	12.3
Barley	12.4	1.8	14.2

Meats contain from 15 to 23 per cent. protein, averaging about 17, and the edible portions as sold in the markets from 6 to 10 per cent. fat, averaging about 8. Or average total protein and fat as purchased, about 25 per cent.

It will be seen from this that cotton-seed flour has a nutritive value more than five times that of wheat flour, nearly three times that of lean round of beef as bought in the markets and *from three to thirty times that of many of the best known and most frequently used articles of food*, while its every day use by many of our home people, and its rapidly increasing popularity everywhere fully establish its delicious flavor, ease of digestion and entire healthfulness.

Cotton-Seed Flour Should be Mixed with Wheat Flour.

Comparatively speaking wheat flour is nearly all starch and cotton-seed flour is nearly all protein. To get the best results, therefore, a mixture of these flours should be made as follows:

For Yeast Bread.

	By weight
Cotton-seed flour	1 part
Wheat flour	1 part

For Biscuit Bread.

	By weight
Cotton-seed flour	1 part
Wheat flour	2 parts

For Soft Ginger Bread.

	By weight
Cotton-seed flour	3 parts
Wheat flour	1 part

For Fruit Cake.

	By weight
Cotton-seed flour	4 parts
Wheat flour	1 part

Just as *good* cotton oil is the best and purest cooking fat on the earth, and *good* cotton-seed flour the best bread-making material the world has ever known, bad cotton oil and poor cotton-seed flour are the very worst in the world for these purposes.

Both are extremely delicate products and both peculiarly subject to rapid deterioration and injury, and for this reason should be bought only of those brands well known for unvarying excellence, and in such quantities as will admit of quick consumption, and in any event should be handled with extreme care.

There are many grades being offered, some are good, and sifted cotton-seed meal is no more cotton-seed flour than wheat bran is wheat flour. There is one way to avoid disappointment in cotton-seed flour, do not allow the *bad* to prejudice you against it *all*.

Buy only the best.



"ST. PATRICK'S CHURCH

Dallas, Texas, July 14, 1910.

Jo W. Allison,

Dear Sir and Friend:—I know you will be pleased to hear of my continued good health since leaving St. Paul's Sanitarium over two months ago. My health not only remains good, but, thank God, it is constantly improving. I feel better and stronger than I have at any time in the past five years.

After our Heavenly Father I feel I owe my present good health to the care and intelligent attention I received from Dr. W. C. Swain and from the truly wonderful effects of your cotton-seed flour bread. Dr. Swain, judging from the effects in my case, agrees with me that it is most wholesome and nutritious and makes an ideal food for those who suffer from kidney trouble.

As you well know, I am no M. D., and know but little of that very necessary science, yet I will try in my own way to tell you of the benefits I received from the use of the cotton-seed flour bread and the way it acted upon my system.

It is now five months since I began this bread. At that time everybody had given me up. My body was badly swollen with dropsy. I could not lie in bed, and to breathe was difficult. Then it was that Mrs. Dan McCarty sent me the loaf of cotton-seed flour bread. As is usually the case in this terrible disease my bowels could be kept open only by using the most powerful and certainly the most disagreeable of medicines every night.

The first thing I noticed about this new bread was that it was very agreeable to the palate. Again it crumbles in the mouth when masticated; thus enabling the gastric juices to pervade every particle of the food when it enters the stomach. But best of all on account of the high percentage of oil it contains, it helped greatly to relieve the constipated condition of the bowels—to such an extent that a strong laxative was necessary only every third or fourth night. I believe that of all the food I have taken in the past five months I received more nourishment—certainly to me more pleasure—from your cotton-seed flour bread than all the other food stuff I am permitted by my diet.

My dear friend, if I can in any way help you to place this great blessing before those especially who are suffering from Bright's disease in its many and terrible forms, you have but to command me. In a few weeks I expect to pay you a visit and will let you know why you have not heard from me before this.

Hoping God will bless you and yours, I am

*Yours in Christ,
Father Mulloy."*

Fat

Vegetable Oils (Fat) vs. Animal Fats.

In this age of dyspeptics we are constantly trying to find food that can be easily digested. The digestibility of cotton oil as compared with other fats is shown by the following table prepared by Prof. Moore of the University of Arkansas:

Refined Cotton-seed Oil.....	93.37%
Pure Olive Oil.....	88.81%
Home-made Lard (soft).....	88.78%
Peanut Oil	85.87%
Home-made Lard (hard).....	73.88%
Beef Suet	73.66%

A study of these figures will be of interest to dyspeptics and those who suffer with poor digestion in explaining why food cooked with cotton-seed oil is more healthful and less likely to cause discomfort than that cooked with any other fat.

From the same high and unprejudiced authority we have the following table showing the great economy in the use of cotton-seed oil and its compounds, as compared with other cooking fats:

	<i>Selling Price</i>	<i>Cost per Calorie or Heat Unit</i>
Butter	.30 per Pound	8.09c
Olive Oil	\$2.50 per Gallon	8.08c
Oleomargarine	.15 per Pound	4.25c
Hogs' Lard.....	.10 per Pound	2.37c
Lard Compound...	.08 per Pound	1.89c
Cotton-seed Oil....	.50 per Gallon	1.57c
Cotton-seed Oil....	.40 per Gallon	1.37c

A calorie is the unit of heat employed in calorimetry and this tabulation shows that with cotton-seed oil at fifty cents per gallon, which is about its usual retail price, butter at thirty cents per pound and olive oil at two dollars and a half per gallon costs over five times as much as oleomargarine at fifteen cents per pound, about three times as much as hog's lard at ten cents per pound, about fifty cents more than lard compound, which is made of cotton-seed oil and beef suet, about one-fourth more, *and this with all the advantages of cleanliness, purity, wholesomeness and ease of digestion in favor of the cotton-seed oil.*

The Modern Use of Vegetable Fat in Man's Daily Economy.

Ever since the dawn of civilization, man has been in need of fats or greases, both as a food and as an article of industry. During the long periods that preceded man's different civilization, animal life alone supplied him with these needed articles; in the strangely remote time preceding and following the Stone Age, the needed fats were entirely derived from the produce of his hunt. During man's nomadic condition, as a herder, sheep and cattle furnished him the fats that supplied his daily needs.

Later, much later, in the cycle of ages, as a tiller of the soil, in the sunny and warm climate of North Africa, man learns how to extract the oily

matter from plants. Olive oil is probably the oldest of the vegetable oils used by him and enters in his daily economy side by side with the sheep tallow of his flocks. The Roman civilization uses olive oil almost exclusively, for all culinary necessities—and even to-day the use of lard has never taken its place. Olive oil is still used for all purposes not only in Italy, but in Spain, and in the Southern part of France, even to the extent of taking the place of butter on the peasant's table.

The principal reasons that explain the almost exclusive use in more northern climates of butter and lard, is the solid consistency of these fats, and the fact that vegetation did not produce any palatable oil-bearing plants. Chemically speaking, this solid condition is explained by the prevalence of the solid stearine over the liquid oleine, as is made clear by the following facts:

STEARINE is the hardest of the common simple fats and melts at a temperature of 160 degrees F.

PALMITINE, also a solid, melts at 124 degrees F.

OLEINE is a liquid, and solidifies at 25 degrees below freezing.

Lard and tallow are mixtures of the three fats, palmitine, stearine and oleine.

Olive oil, cotton-seed oil, and other vegetable fats consist chiefly of oleine.

By heating lard to its melting point, cooling and filtering, the liquid obtained, known as lard oil, consists mainly of oleine, the harder residue is sometimes called stearine and has the consistency of butter. Beef suet, subjected to the same treatment, gives as solid residue, beef stearine, the soft portion being known as oleo oil. Oleo oil is the material often employed under the name of oleo margarine, as a substitute for butter.

Butter, the fat of milk, contains essentially *oleine*, *stearine*, *palmitine*, with a little *butyrin*, to which its odor and flavor is largely due, the melting point of butter is between 100 and 130 degrees F. Commercial butter contains in the mean: fat, 85 per cent.; water, 12 per cent.; salt, 3 per cent.

It is thus seen that the chief difference between these several fats is the melting point, that regulates their liquid, semi-solid or solid condition during our average summer temperature. Every one of these fats has practically the same fuel value and the same nutritive value. Their flavor could be established in imitation of the older edible fats, or left to time to create a new standard of taste. The following table gives a means of comparing the different fats:

Palmitic acid	9,300	small	calories
Stearic acid	9,400	"	"
Fats average	9,400	"	"
Butter fat	9,300	"	"
Cane Sugar	4,000	"	"
Starch	4,200	"	"
Egg Albumin	4,000	"	"

Both in the case of butter and in the case of lard, the most advanced means of production have reached this anomalous condition, where man produces a food from the vegetable world, rich in fat and protein, feeds it to animals to be again transformed in their bodies into meat and fat. The science of feeding has become an exact science and if the body of the animal is still used as a chemical laboratory, it is because science can not replace this four-legged industrial plant in producing the meat necessary to our consump-

tion. The same can not be said, however, of our fats. The only transformation that takes place in the chemistry of life, in the case of fats, is the transformation of oleine into stearine, from a liquid fat to a solid fat, with all the disadvantages of dirt, uncleanness and the danger of diseases inherent to animal life. The word butter or lard represents a standard, impressed upon the human mind by thousands of years of daily use. Scientifically speaking, this standard is entirely artificial and a matter of taste or habit. We can easily conceive that a new generation, brought up in a scientific age, will regard with wonder and disgust the consumption of fat, by their forefathers, extracted from the teats of a cow, or the belly of a hog, and prefer the scrupulously clean product of our modern industry, free of all danger of uncleanness and disease.

Quoting from Lewkowitsch, Chemical Technology of Oils and Plants:

"From a sanitary point of view, no objection can be raised to the substitution of cheaper animal or vegetable fats for the more expensive ones as long as their substitutes are sold under their proper name and not used for fraudulent purposes."

It is rather to be desired that the industry of plant substitute should extend further, yielding as it does cheap, palatable foodstuff, thereby tending to exclude from consumption the unwholesome fats from diseased animals, or at least fats which are prepared under conditions that do not satisfy the most rigorous demands as regards cleanliness.

The enormous strides which this industry has made during the last few years has shown that the popular prejudice which at first militated against the legitimate expansion of this trade has been overcome. Nay, the excellence of the product has even reacted favorably on the antiquated methods of producing lard and butter and has helped to introduce much needed improvement on the preparation of these foodstuffs.

The quality of an edible fat, irrespective of the nature of its components, depends in a great measure, if not solely, on its palatableness. The question of the digestibility of edible fats has been studied by A. Meyer, A. Jolle, J. Konig, Luhring, and Leffman, and shows practically a consensus of opinion that all fats have the same nutritive value. The problem of transforming oleines into stearines has been partially solved today by science, and under the name of Crisco and Crusto, and others still to come a solid product is obtained from our tremendous cotton-seed oils supply, and which still further improved will in a few years largely take the place of our unclean and antiquated butter and lard. Derived from the vegetable world, made under all guarantees of cleanliness, and free from all contamination, they are undoubtedly entering little by little into our daily use. A new generation, accustomed from its tender age, to the use of these fats, will, as we said before, hardly be able to believe that there was time when the cow and the hog were the main sources of our edible fats.

Amongst the vegetable oils cotton-seed oil and cotton-seed stearine take the most prominent place. The best grade of cotton-seed oil, devoid of free fatty acid and practically free of the peculiar flavor characteristic of the oil is known under the name of "*butter oil*." From a hygienic, practical and economical point of view, a vegetable fat is undoubtedly a superior article,

if compared to animal fat. As said before, our Northern countries are laboring under artificial standards of edible fats, impressed upon us by habit and routine.

Better understanding of food chemistry—the teaching of domestic science amongst new generations—combined with general broadening of our views will undoubtedly soon modify time-honored, but antiquated ideas, and our next generation will not run a clean vegetable fat through the belly of a hog before canning it for consumption.

Digestion of Food

Up to a few years ago, to use the words of E. Fisher, “Physiologists were in the position of unskilled laborers, who saw loads of building material dumped, but who did not know for what particular purpose each individual substance was used.”

Digestion is the process which the food undergoes, under the influence of ferment present in the gastro-intestinal tract, preparatory to its utilization by the body.

Food can roughly be classified under the heading of *protein, fats, carbohydrates* and *ash*. They are assimilated in the body as follows:

	<i>Acting Enzyme</i>	<i>Where Found</i>
PROTEIN	Pepsin	Gastric juice.
	Trypsin	Pancreatic juice.
	Erepsin	Small intestine.
FATS	Lipase	Pancreatic juice, and certain tissues.
CARBOHYDRATES	Ptyalin	Saliva.
	Diastase	Pancreatic juice.
	Maltase	Small intestine.
	Invertase	Small intestine.

Cannon, by feeding with food impregnated with bismuth salts, and using X-ray, shows that carbohydrates leave the stomach most rapidly, then the protein, and finally the fats.

Two factors enter preventing rapid emptying of the stomach.

First, presence of fat; second, excessive acid secretion engendered by abundant protein.

Protein

Protein is a group of food material containing nitrogen. They are the flesh or muscle formers, also furnish material for composition of blood, hair, horn, wool, etc. Proteins are indispensable to existence, they split into amido acids and are eliminated through the kidneys and urine. Some of these excretive products, belonging to the purin and xanthine group, can be highly poisonous. If formed in excessive amount over what the liver and kidneys can take care of, they are taken up by the organism, producing poisoning symptoms and death. Fermentation within the intestinal tract gives rise to similar product distinctly toxic. The body tends to adjust its protein katabolism to its protein supply. When the body is accustomed to a certain ration of protein katabolism, it requires an appreciable length of time to adjust itself to a higher or lower ration.

Fats

Fats, if in fine emulsion or greatly subdivided, as found in cotton-seed meal, can be decomposed by the stomach and are dealt with by the pepsin and the gastro-lipase. In the small intestine, lipase and zymogen ferments convert fats, by hydrolysis into fatty acids and glycerine, bile salts acting as a solvent, although bile should be really looked upon, rather as the excretive result of hepatic metabolism, than a digestive juice; 85 per cent. of the protein, and all the assimilated fat, disappears before the small end of the lower intestine is reached. Carbohydrates and fats are ultimately converted into carbonic acid gas and excreted mainly through the lungs, while the nitrogen waste products from the metabolism of proteins are excreted through the urine. Every animal has the possibility to store in his tissue an excess of food stuff to be called upon on special occasions. Snakes supply the amount of food, necessary to sustain life, in large quantities and at periods far apart, eating sometimes their own weight of animal matter. Bears accumulate fat during the fruit and nut season, using this excess during their long winter's sleep. Often the adipose layer is used by nature as a protective layer—this is especially seen in aquatic animals, whales, seals, and ducks—where the fat is consumed in large quantity as a heat producer to maintain the normal body temperature in the presence of a cooling medium.

The possibility to withstand prolonged fast is directly proportional to the animal's power to store excess of food stuffs. This property is especially found among the carnivorous and omnivorous animals and increased by nature in view of the uncertainty of the food supply of these animals. This stored energy is generally in the shape of fat. This normal and hereditary tendency has been used by man, and through careful breeding developed to its utmost in some of our swine breeds—the Berkshire and Poland China for instance.

Carbohydrates

The *Carbohydrates* include the simple sugars, and all the complex substances, dextrin, starch, etc., which by hydrolysis can be resolved into simple sugars. They are first acted upon by the saliva and then by the pancreatic secretion. The bulk of carbohydrates of the food, having been converted into monosaccharides in the intestines is taken up by the capillary blood vessels of the intestinal wall, into the circulation, and the excess, temporarily stored away in the liver under the form of glycogen, later passing into the blood as glucose, to be oxidized in the muscles and furnish energy which appears as external or internal work. Ultimately the carbohydrates are eliminated as carbon dioxide through the lungs. Carbohydrates are therefore the heat and energy-producing food by excellence, the coal that the animal engine burns—adding but little to the make-up of the machine itself, and only if supplied in excess of the needs of the body and accumulated in the liver and muscle does this surplus of carbohydrates tend to be converted into fat and stored in the tissue as such.

Ash

The body of the animal is composed of 4% of mineral matter which must be derived from its food supply. As a matter of course, the largest demand on mineral matter must necessarily be during the animal's growing

period. Generally speaking the needed mineral matter is amply supplied by the average feeding material and is not considered as a problem in our study of alimentation. The question deserves, however, much closer attention since the so-called inorganic elements not only take part as a constituent of the animal skeleton, but are a necessary element of the protoplasm of active tissues, a part of the fluid of the body and before all the needed material governing the acidity or alkalinity of our digestive juices and other secretions, maintaining the solvent power and neutrality of all body fluids. Mineral matter necessary to the growth and maintenance of the animal body is mostly all introduced as complex organic compound obtained from the lower form of vegetable or animal life, the higher mammals not being able to assimilate directly the mineral bases. This fact is well illustrated by the frequent observation of a disease commonly known on our western plains as "The Creeps," scientifically as Osteomalacia and due to the deficiency of lime salts in foods. The western plains are all a lime formation, limestone abundant. The only water available to cattle is hard water, often containing its maximum of lime salts, and still with all this tremendous *inorganic* supply of lime, the animals suffer of a lack of this substance and it becomes a matter of necessity to supply the needed amount of an *organic* lime compound by artificial feeding of calcium-containing food material. Cotton-seed meal with an ash content of 7.2% mostly lime has given the best results in the treatment of this disease, and not the rather ludicrous formula preconized by some food expert, consisting of cement blocks as a "lick" for the suffering cattle. Apparently there should be more attention given to the choice of such food as will increase the calcium contents of the dietary.

Man or animal cannot subsist and remain in health on a single diet. The body requires a certain ration between proteins, fats, carbohydrates and mineral salts. This ration is generally expressed by the following formula:

$$\text{Nutritive Ratio} = \frac{\text{Protein}}{\text{Fat} \times 2.5 + \text{Carbohydrates}} = \text{about } \frac{1}{4.3} \text{ in milk}$$

Carbohydrates are valuable food, still man or animal could not subsist on sugar alone. The feeling of repulsion and nausea with subsequent disease and death following a single diet are well known in everyday life. The above is eminently true in the abnormal conditions in the intensive feeding of farm animals for the rapid production of meats, fats or growth.

Growth in animal takes place at a rate fixed by the species and individuality and cannot be materially stimulated by a larger supply of protein in the food. *Fattening*, on the other hand, is dependent on the total amount of food consumed in excess of that required for maintenance. It is brought about more easily at mature age, partially because less of the food is demanded for growth, partially because the older animals consume less in muscular activity. The fattening ration then, for an animal at a given age, must contain more fat and less protein than a growing ration. The maintenance requirement of the animal must first be satisfied before any gain can be produced. The more feed an animal can be induced to consume in excess of its maintenance ration, the more rapid will be the gain and the more

cheaply it will be produced. It is only by the use of concentrated food that it is possible for the animal to consume the large amount of food required to produce a rapid gain. The excess of food is stored away by the organism mostly as fat, its gain being obtained at the expense of both protein and fat. "The carbohydrates in the light of modern physiology acting as protecting the fats of the body from oxidation."—Long's Physiological Chemistry.

Fats in the body constitute a reserve material in which potential energy is conveniently stored up. In sickness, disease, or famine the fat is called upon to supply the needs of the body.

In the scheme of nature, each species is given a certain degree of plasticity by virtue of which it adapts itself to a new environment when the old one changes. The whole truth of the evolution of species in nature is founded on this law. Species differ in the degree of plasticity but every species and every individual of each species has it to some degree. If the environment changes faster than the species, then in nature it dies out.



Chapter XI.

Fertilizer

Fertilizer

THE three substances that are most frequently lacking in soils, and the ones that are most abundantly taken from them by plants, are *nitrogen*, *phosphoric acid* and *potash*. Of these, *nitrogen* is the most expensive, is used in larger quantities in plant growth, and loses more rapidly by evaporation; but the careful farmer, by planting and turning under leguminous crops, such as peas, beans, clover, alfalfa, vetch, etc., on certain parts of his land each year so that in a few years all of his land will be benefitted by this treatment, can draw from the vast supply of nitrogen in the atmosphere an ample supply of this costly and positively essential mineral fertilizer, as bacteria that grow upon the roots of these special plants convert the atmospheric nitrogen into nitrates that are soluble in water and immediately useful as plant food. The growing and turning under of these crops supplies an abundance of decaying vegetable matter, which is absolutely essential to profitable plant growth.

Phosphorus is next in importance, and, while not used in such large quantities, is absolutely essential. The sources of supply are limited, and the farm or home supply must come largely from animal manures, liquid as well as solid, and from what is contained in vegetable matter, dry or green, that is plowed into the soil. It is, therefore, of the utmost importance that a very large part of everything raised upon the farm should be fed upon the farm, and all manures saved and returned to the land. Commercial phosphorus, as a rule, is purchased in the shape of acid phosphate, or in finely-pulverized high-grade phosphate rock.

Potash is equally essential to successful plant growth, but as a rule is more abundant in the average soil than the other two elements mentioned. If, after using all animal manures and ashes, potash is still lacking, it can be purchased in the shape of *kainit*, sulphate and muriate of potash. The needs of soils can be determined in a fairly practical way by watching the



growth of plants. *Nitrogen* makes deep, green, vigorous growth of leaf and stalk, while *phosphoric acid* and *potash* are directly concerned in perfecting the fruit.

Soil deficient in nitrogen is nearly always short in its supply of phosphoric acid, and it is generally desirable, under such circumstances, to use a fertilizer containing both nitrogen and phosphoric acid. For cotton, a mixture of two hundred pounds of cotton-seed meal and two hundred pounds of acid phosphate applied between the rows and harrowed in, generally gets good results, and a mixture of two hundred pounds of meal to one hundred pounds of acid phosphate and fifty to one hundred pounds of kainit applied in the same way per acre is suitable for corn.

As a rule, the sandy and lighter soils, and the black lands where an abundance of vegetable matter and a fair amount of stable manure have been turned under, give better results from the use of commercial fertilizers than do the compact and sticky black lands. This indicates very clearly that on the best black lands more stable manure should be used, and more green or dry cover crops should be turned under, so as to make the land more porous and friable, easier to cultivate and more susceptible to the beneficial effects of mineral fertilizers, but we cannot too strongly emphasize the fact that much the best fertilizing material that one can possibly use is well-rotted stable manure.

The only difficulty is to get enough of it: even after raking up everything that can be found in the line of manure, including what there is in the lots, pig pens, chicken houses, kitchen yards, toilets and closets, in fact, after saving every pound of manure of every kind, liquid and solid, and all rough stuff, straw, stalks, etc., there is still but a small quantity in comparison with what is needed and could be profitably used. Remember that every pound of so-called waste should be spread upon the land at the earliest possible date after it appears, as the sooner it is plowed or harrowed into the ground the less loss there will be from evaporation by the sun and





washing by the rains. Another advantage of this method of utilizing all of the waste about the place will be that the premises will be kept sweet and clean, thus adding to the health and comfort of the family.

As it is not always convenient and profitable to haul out small quantities of manure, it is a good idea to start a compost heap in a vacant stall or shed that will act as a storehouse in which to accumulate and compound manure all through the season. After there has accumulated in this way enough manure, straw, stalks, trash, etc., to be about ten inches deep, it would be a good idea to spread over the manure, say, one hundred pounds of high-grade, finely-ground phosphate rock or one hundred pounds of acid phosphate, if the first is not easily obtainable; then add as it is accumulated, another layer of manure and waste of various kinds eight or ten inches deep over this heap; then spread a layer of three hundred pounds of cotton-seed or two hundred pounds of cotton-seed meal, remembering to keep the heap moist all the time by occasionally wetting it. Continue this process in about the proportions named until the compost heap is five, six or seven feet high, drawing in the sides by degrees until the top of the pile is about one-third as wide and broad as the bottom; then cover the whole with soil two or three inches deep.

At any time after this compost heap has been finished for a month and there is a dry spell, so that it is safe to go over the land with a wagon, haul out this compost, putting from five to ten loads to the acre, thoroughly mixing it with the soil, either by using a disc harrow or plowing it under and harrowing the land afterward. As soon as this heap has been spread upon the land, the same stall is ready for whatever waste may be accumulating on the premises to start another compost heap after the order of the first.

It would pay handsomely to use one or more tons per acre of ground white rock broadcast upon the land, if it can be bought and distributed for less than \$5 a ton.

In the meantime, do not miss an opportunity to bring back a load of stable manure, ashes or other fertilizing matter that may be given away or that can be bought cheaply in the village or town where the farmer goes to sell a load of produce. Aim as nearly as possible to keep all the cultivatable land busy growing some kind of a crop—cow-peas, vetch, rye, oats or some other cover crop—to be turned under as a wonderfully valuable fertilizer when the land is plowed for the crop that is to follow.

If it is not possible to fertilize the land as desired, in time for the coming crop by any of the methods mentioned above, we suggest the purchase, in moderate quantities, of the best commercial fertilizers that are recommended for the special crops that one intends to grow, by reliable manufacturers or dealers who have them for sale. Use them in moderation and watch results very carefully, and compare the benefits with the extra cost for future information.

An old English proverb says: "No grass, no cattle; no cattle, no manure; no manure, no crops."

Remember that if the land contains a properly balanced fertilizing ration and has been thoroughly and constantly cultivated, so as to make this plant food available and thus keep the crop growing uninterruptedly from start to finish, it will greatly increase the grain yields and their quality, wonderfully increase the cotton yields, the length and strength of the staple (which has markedly deteriorated on account of poor seed, bad cultural methods and the poisonous habit of growing the same or a kindred crop on a given tract of land year after year), and add millions of dollars to the value of all these crops.—Texas Industrial Congress, Dallas, Texas, Bul. No. 3, Agricultural Correspondence Series.



"The animal food content of a fodder or feed is the prime consideration in stock feeding. If, however, stock feeding is considered in its true relationship to the entire farm enterprise, as an integral part thereof and not as a matter by itself, the plant food content of cattle feeds becomes a thing of great importance. This fact, still unrecognized by the generality of western farmers, is thoroughly appreciated in the east and needs no advocacy here. While the general proposition is agreed to, the relationship of the sundry fodders and feeds to the quality of the manure is not so clear to many farmers. An animal voids nothing that it does not eat or drink; and its voidings are of a different quality, so far as plant food is concerned, in proportion to the variations in the food eaten. Rich food makes rich manure and poor food, poor manure. Clover hay, cotton-seed and linseed meals, gluten feed, bran, distillery and brewery by-products, etc., are of distinct value in this respect, while corn meal and the like rank relatively low. It should not be supposed that every particle of the plant food contents of a feed of necessity reach the soil. More or less will become available to plant growth according to the care or lack of care with which the manure is handled. It is fair to assume, however, that the losses will be proportional, regardless of the quality of the manure. To the farmer who carefully observes the well known methods of preserving manure from fermentation and leaching, this table is of importance. To him who does not try to follow modern methods in this respect, it has much less value."—Vermont Agricultural Experiment Station, Burlington, Vt., Bul. No. 152.

"A feed is valuable not only for the effect on the animal, but for manure which it may produce. This fact is not generally recognized in Texas. By proper methods of saving the manure, it ought to be possible to save 50 per cent. of the plant food in the feed. Cotton-seed meal containing 7 per cent. nitrogen, has a fertilizer valuation of \$32.20 per ton. If one-half of this is saved it is \$16.10 per ton. This is a saving not to be despised. The profit in fattening animals in some cases lies entirely in the manure saved and applied to maintain the fertility of the farm."—G. S. Fraps, before Cotton-Seed Crushers' Association, Houston, July, 1912.

"The person who feeds cotton-seed meal intelligently, and utilizes the manure, can pay more for the meal, and at the same time make a larger profit than a man who allows the manure to go to waste. This is the reason that the European farmer can afford to pay ocean freights, and a variety of profits, so that the cotton-seed meal costs much more than it does in Texas, and yet make a greater profit than the Texas farmer, for the European farmer is most careful to save every scrap of the manure."—Dr. G. S. Fraps, Address to the Cotton-Seed Crushers' Association, Houston, Texas, July, 1912.

"One phase of great importance has not so far been mentioned in connection with the feeding of meal and hulls as discussed in this bulletin, the resulting increased fertilizer of the land. Cotton-seed meal is bought in this State and applied directly to the land as a fertilizer. Almost all of the fertilizing value of the meal remains in the excreta of the feeding animals, and if any care be taken, it may be readily conserved and applied to the land. By feeding the meal to profitable beef animals, the cost of the meal is entirely recovered in the beef animal and a profit beside, leaving practically all the fertility of the meal to be scattered upon the farming land as a bonus to the cattle feeder."—Bul. No. 121, Mississippi Agricultural Experiment Station, Agricultural College, Miss.



Fertilizer Formulas.

Under condition of natural growth and decay, when no crops are gathered in, or consumed on the land by livestock, the original growth, on dying down and decaying returns to the soil and atmosphere the elements taken from them during life. Under cultivation, a succession of crops deprives the land of the constituents which are essential to healthy growth, without an adequate return to the land of the matters removed in the produce, its fertility cannot be maintained for many years. Where land is plentiful and easy to be obtained, it is often more convenient to clear fresh land than to improve more or less exhausted land by the application of labor, manure, and skill. This much however remains an undisputed fact, that continuous cropping, without return of manure, aids in the deterioration of the soil, and is well seen in the case of the wheat-growing area of the Northern States. The sooner our farmer realizes the necessity of saving this capital that nature has buried in the soil of his farm—before its partial or complete exhaustion—the better off he will be. For gradually but mercilessly from year to year the productive power of the richest virgin soil under cultivation decreases and finally must reach a state of complete exhaustion without the timely application of manure or fertilizer.

Fertilizer Formulas.

In the following pages will be found fertilizer formulas for some of the principal crops.



Formulas for Cotton.

The following formulas for cotton are the result of careful experiments by trained investigators on worn soil. Each one will analyze about 20 pounds of nitrogen, 50 pounds of phosphoric acid, and 15 pounds of potash in the whole formula. Each formula represents the amount to be applied per acre to get the best results:

Muriate of Potash.....	20	lbs.	Kainit	64	lbs.
Acid Phosphate	281	lbs.	Acid Phosphate	273	lbs.
Cotton-Seed meal.....	286	lbs.	Cotton-seed meal	143	lbs.
			Cotton-seed	13	1-3 bus.
Wood Ashes (unleached)..	164	lbs.			
Acid Phosphate	261	lbs.	Kainit	45	lbs.
Cotton-seed meal	286	lbs.	Acid Phosphate	254	lbs.
			Cotton-seed	26	2-3 bus.

Farish Furman's Famous Formula.

	Pounds.
Barn-yard manure	750
Cotton-seed	750
Acid Phosphate	367
Kainit	133
	2,000

Use from 400 to 800 pounds per acre.

A Compost Famous in Louisiana.

Green cotton-seed	100 bushels
Stable manure	100 bushels
Acid Phosphate	2,000 pounds

Use from 400 to 800 pounds per acre.

The Georgia Experiment Station formula for cotton (Colonel Redding, former Director), has been tested there with excellent results. It is as follows:

Acid Phosphate	1,000 pounds
Muriate of potash.....	75 pounds
Cotton-seed meal	700 pounds
	1,775 pounds

Apply so as to get from 200 to 500 pounds of acid phosphate per acre.



Fertilizer for Corn.

	Pounds
Acid phosphate, 16 per cent....	1,200
Cotton-seed meal	600
Muriate of potash.....	200
	2,000

Broadcast 400 pounds per acre of this formula.

Formulas for Wheat.

The formulas are given of different materials to suit the convenience of different people, living in different localities; but all are so calculated as to contain practically the same amounts of phosphoric acid, potash and nitrogen.

The quantities given in each formula are the amounts to be applied per acre.

Kainit	64	lbs.	Unleached wood ashes.....	164	lbs.
Acid Phosphate	137	lbs.	Acid Phosphate	130	lbs.
Cotton-seed meal	143	lbs.	Cotton-seed meal	286	lbs.
Cotton-seed	13	1-3 bus.			
Muriate of Potash.....	20	lbs.	Muriate of Potash.....	20	lbs.
Acid Phosphate	140	lbs.	Acid Phosphate	150	lbs.
Cotton-seed meal	286	lbs.	Nitrate of Soda.....	64	lbs.
			Cotton-seed	13	1-3 bus.

Fertilizer for Peaches.

In practice it is recognized that the plant does not, or can not, make use of every pound of plant food given it, and that there is considerable waste or loss, so that I would advise for peaches the application of not less than the following amounts per acre:

Formula Per Acre for Peaches.

	Pounds
Cotton-seed meal	150
Sulphate potash	50
Acid Phosphate	50

Of course it is impossible to give a formula to fit all cases. The grower should take into consideration the age of his trees, and consequently the amount of fruit he expects to remove per acre; also the number of trees per acre and the character of his soil, whether clay or sandy, rich or poor.



Special Formulas for Trucking Crops.

The formulas given below have been selected mainly from some of the trucking bulletins of the North Carolina Agricultural Experiment Station; 500 pounds to be used per acre.

For Irish Potatoes:

300 lbs. Nitrate of Soda.
600 lbs. Cotton-seed meal.
800 lbs. Acid Phosphate.
300 lbs. Muriate potash.

For Irish Potatoes:

300 lbs. Nitrate Soda.
600 lbs. Cotton-seed meal.
800 lbs. Acid Phosphate, 13 pr. ct.
300 lbs. Muriate potash.

For Beets and Lettuce:

300 lbs. Nitrate Soda.
800 lbs. Cotton-seed meal.
600 lbs. Acid Phosphate, 13 pr. ct.
300 lbs. Muriate potash.

For Cabbage, Cauliflower, Cucumbers and Melons:

300 lbs. Nitrate Soda.
750 lbs. Cotton-seed meal.
700 lbs. Acid Phosphate, 12 pr. ct.
250 lbs. Muriate potash.

For Spinach:

300 lbs. Nitrate of Soda.
500 lbs. Cotton-seed meal.
1,000 lbs. Acid Phosphate, 14 pr. ct.
200 lbs. Muriate potash.

For Radishes and Turnips:

250 lbs. Nitrate Soda.
550 lbs. Cotton-seed meal.
900 lbs. Acid Phosphate, 13 pr. ct.
300 lbs. Muriate potash.

For Asparagus:

200 lbs. Nitrate Soda.
700 lbs. Cotton-seed meal.
800 lbs. Acid Phosphate, 13 pr. ct.
300 lbs. Muriate potash.

For Egg Plant and Tomatoes:

200 lbs. Nitrate of Soda.
700 lbs. Cotton-seed meal.
840 lbs. Acid Phosphate, 13 pr. ct.
260 lbs. Muriate potash.

For Onions:

200 lbs. Nitrate Soda.
750 lbs. Cotton-seed meal.
750 lbs. Acid Phosphate, 11 pr. ct.
300 lbs. Muriate potash.

For Sweet Potatoes:

100 lbs. Nitrate Soda.
500 lbs. Cotton-seed meal.
1,100 lbs. Acid Phosphate, 13 pr. ct.
300 lbs. Muriate potash.

For Beans and Peas:

100 lbs. Nitrate Soda.
450 lbs. Cotton-seed meal.
1,200 lbs. Acid Phosphate, 11 pr. ct.
300 lbs. Muriate potash.

Serial No. 57, Georgia Department
of Agriculture, 1911-1912.

The use of cotton-seed or cotton-seed meals as a fertilizer is of course a wasteful method if applied direct to the soil. Manure of cotton-seed fed animals should be used in its place, using twice the amount given in the formulas.



Chapter XII.

Effect of Locality on Feeding Rations

Cotton-seed as a Feeding Stuff.

The composition of cotton-seed and cotton-seed meal is about as follows:

Feed	Protein	Fat	Carbohydrates	
			Crude Fiber	Nitrogen-free extract
Cotton-seed	18.4%	20%	23.2%	24.7%
Cotton-seed meal or cake	44%	8%	7%	24%

As might be expected cotton-seeds are more difficult of digestion than the meal or cake because of the greater per cent. of fat in the seed. Carbohydrates are digested in the mouth and intestines by ferments in the saliva and the pancreatic juice. Fats are digested in the intestines by the ferments of the pancreatic juice. The proteins are digested in the stomach by the ferments of the gastric juice. Easily digestible carbohydrates and fats tend to stop the digestion of *proteins* in the stomach, which may cause digestive ailments. Upon this point Prof. Pavlov in his work on "*The Work of the Digestive Glands*" makes the following statement:

"No less instructive is a comparison of the results of our experiments upon fat with the dictates of instinct and also with the precepts of dietetics and therapeutics. Everybody knows that fatty foods are heavy, that is, difficult of digestion, and in the case of weak stomachs they are usually avoided. We can now understand this physiologically. The existence of fat in large quantities in the chyme (in the stomach) restrains, in its own interest, the further secretion of gastric juice, and thus impedes the digestion of protein substances; consequently, a combination of fat and protein-holding foods is particularly difficult to digest, and can only be borne by those who have good stomachs and keen appetites."

This is not only so with fatty foods in general, but it has been shown to be so in actual feeding experiments with *cotton-seed*. The comparative digestibility of the two feeds have been determined by Prof. Bailey which may be seen upon another page and is as follows:

Feed	Protein	Digestibility of			Fat
		Fiber	Nitrogen-free	Extract	
Cotton-seed	68%	75%	50%		87%
Cotton-seed meal	88%	55%	60%		93%

Hence in feeding cotton-seed there is a loss of 20 per cent. protein, 10 per cent. nitrogen-free extract, and 6 per cent. fat, but a gain of 20 per cent. crude fiber which is of very little value as a feed anyway, especially since cotton-seed meal contains only 5.6 per cent. of fiber, whereas the cotton-seed contains 23 per cent. fiber. The real expensive part of food is protein. The protein lost in feeding cotton-seed is equal to the total amount of protein in corn.

Feeding Rations. Effect of Locality.

It is perfectly natural that feed indigenous to particular localities should be used in such localities to the largest possible extent, unless a better or cheaper feed can be imported. Louisiana utilizes its blackstrap molasses, Vermont and New York their apples; Colorado its beets; Canada its linseed oil cake; New Mexico its prickly pear; Germany its brewers' grains; Ireland its potatoes. The list could be continued. The following pages show

some of the rations that have been made and used in a few of such localities and made the basis of experimental feeding at the several Agricultural Experiment Stations mentioned herewith.

The point is that cotton-seed meal is used as a part of nearly every ration for farm live stock in all civilized countries when it is necessary to buy a food rich in protein. And still it is not used in as large quantities as its value would justify, even in cotton countries.

Louisiana Bulletin No. 115.

Agricultural Experiment Station, Baton Rouge, La.

The following two sample rations will serve to illustrate how they may be compounded; the first ration being for a cow weighing 1,000 pounds, and producing, daily, 20 pounds of milk, showing 3 per cent. butter fat:

<i>Lbs.</i>	<i>Dry Matter lbs.</i>	<i>Protein lbs.</i>	<i>Carbohydrates lbs.</i>	<i>Fat lbs.</i>
1 Cotton-seed meal....	.92	.37	.17	.12
2 Corn and cob meal..	1.70	.09	1.20	.06
12 Sweet potatoes.....	3.48	.11	2.64	.04
16 Mixed hay.....	14.74	.94	6.54	.19

The maintenance requirement for this 1,000-pound cow would be:

<i>Protein</i>	<i>Carbohydrates</i>	<i>Fat</i>
.7	7.0	.1

If these amounts are deducted from the totals of those given in the ration, then the remainder will represent the nutrients required by the cow for milk production.

Sample ration No. 2 is for a cow of similar weight and milk production, but which latter shows 5 per cent. butter fat. (See table):

<i>Lbs.</i>	<i>Dry Matter lbs.</i>	<i>Protein lbs.</i>	<i>Carbohydrates lbs.</i>	<i>Fat lbs.</i>
2½ Cotton-seed meal ...	2.30	.93	.42	.31
1 Corn and cob meal...	.85	.04	.60	.03
6 Sweet potatoes.....	1.74	.05	1.32	.02
12 Mixed hay	10.45	.71	4.91	.14
7 Blackstrap Molasses..	5.46	.00	4.62	.00
	20.80	1.73	11.87	.50

Michigan State Agricultural College, Bulletin 261. Rations for Steers.

Grain Mixture E.

Beet Pulp	3 parts
Corn and Cob Meal.....	2 "
Oil Cake	1 "
Cotton Seed Meal.....	1 "

Storrs Agricultural Experiment Station, Storrs, Conn.

A ration of concentrated feeds has been used at this station composed of the following:

- 400 pounds bran,
- 100 pounds corn meal,
- 200 pounds middlings,
- 100 pounds oil-meal.

Vermont Agricultural Experiment Station, Bulletin No. 119.

- No. 1. Wheat bran, 4 parts; cotton-seed meal, 1 part; linseed meal, 1 part.
 No. 2. Wheat bran, 4 parts; India wheat, 2 parts.
 No. 3. Wheat bran, 2 parts; cotton-seed meal, 1 part; linseed meal, 1 part; India wheat, 2 parts.
 No. 4. Wheat bran, 4 parts; hominy feed, 2 parts.
 No. 5. Wheat bran, 2 parts; cotton-seed meal, 1 part; linseed meal, 1 part; hominy feed, 2 parts.
 No. 6. Wheat bran, 2 parts; cotton-seed meal, 1 part.
 No. 7. Wheat bran, 2 parts; linseed meal, 1 part.

Speaking of the production of milk the following statement occurs in this bulletin:

Cotton-seed and linseed meals have been standard feeds for several decades. Their position in the feeding world is well established and, as "good wine needs no bush," so they ought to need no further demonstration of their merits. Yet they are still too little used.

The outcome is clear again here and all in one direction, namely, a 2 to 3 per cent. loss in production when linseed meal replaced the cotton-seed, and a 4 to 5 per cent. loss in proportion to dry matter eaten.

In these trials cotton-seed meal, even the relatively poor grade fed, won out handily as compared with linseed meal. Yet the writer believes that the latter is an advisable concomitant to use with cotton-seed, because of its laxative properties.

The Cornell Reading-Courses, Ithaca, N. Y.

Feeding Standards.

The requirements of animals as to amount of necessary nutrients for such purposes as milk production, beef production, labor production, and the like, as well as the relation between these nutrients, have been the subject of much inquiry. Investigators have sought to put these requirements into definite form. They have given to this table of requirements the name "feeding standards." The standards are merely a statement of the necessary amount of nutriment required by an animal for a given purpose for a certain length of time. They are based on the requirements for 1,000 pounds live weight in 24 hours. The requirements are usually stated in terms of dry matter, digestible protein, digestible carbohydrates (fiber plus nitrogen-free extract), and digestible fat.

Calculating in detail from Table 1, the amounts of dry matter, digestible nutrients, and total nutriment in the several foods in the suggested ration are as follows:

<i>Food</i>	<i>Dry Matter</i>	<i>Digestible Protein</i>	<i>Digestible Fiber</i>	<i>Digestible Nitrogen-Free Extract</i>	<i>Digestible Fat</i>	<i>Total Nutriment</i>
10 lbs. Red clover hay...	8.47	.710	1.340	2.440	.180	4.895
30 lbs. Corn silage	7.92	.420	1.500	2.760	.210	5.153
5 lbs. Corn and cob meal	4.25	.220	.150	2.850	.145	3.546
4 lbs. Gluten feed.....	3.63	.852	.208	1.904	.116	3.225
1 lb. Cotton-seed meal.	.93	.376	.022	.192	.096	.806
Total.....	25.20	2.578	3.220	10.146	.747	17.625

Purdue University, Agricultural Experiment Station, Lafayette, Ind.

Bulletin 136.

The Value of Corn Silage, Cotton-seed Meal and Clover Hay for Fattening Two Year Old Steers.

With this object in view the tests reported in Part II of this bulletin were conducted. The following rations were used:

Shelled corn and clover hay.

Shelled corn, cotton-seed meal and clover hay.

Shelled corn, cotton-seed meal and corn silage.

Shelled corn, cotton-seed meal, clover hay and corn silage.

The Agricultural Experiment Station of the Colorado Agricultural College.

Bulletin 73.

Rations With Beet Pulp. Fattening Cattle Weighing 1,000 Pounds.

First Period.

		<i>Dry Matter</i>	<i>Protein</i>	<i>Carbo- hydrates</i>	<i>Fat</i>	<i>Nutri- tive Ratio</i>
Standard Ration		30	2.5	15.0	0.5	1:6.5
Alfalfa	15 lbs.	13.7	1.65	5.94	0.18	
Beet pulp	75 "	7.6	0.45	5.47		
Cotton-seed meal	2 "	1.8	0.75	0.3	0.24	
		23.1	2.85	11.71	0.42	1:4.4

Storrs Agricultural Experiment Station Bulletin No. 73.

The medium or standard daily ration has a nutritive ratio of 1:5.5 and is made up as follows:

Daily Ration for Each Calf, by Monthly Periods, from Dec. 7, 1910, to March 29,

- 35 lbs. silage.
- 12 lbs. mixed hay.
- 2 lbs. wheat bran.
- 2 lbs. corn meal.
- 2 lbs. gluten.
- 2 lbs. cotton-seed meal.

Fifty-two calves were used in the second experiment.

Cotton-seed meal, cotton-seed hulls, and mixed cowpea hay were the feeds used.

The feeds were valued as follows:

Cotton-seed meal, per ton	\$26.00
Cotton-seed hulls, per ton	7.00
Mixed pea-vine hay, per ton	15.00

Daily Ration for a Dairy Cow.

1911.

Period	Cotton-Seed Meal Pounds	Cotton-Seed Hulls Pounds	Hay Pounds
First 28 days.....	2.84	10.20	0
2nd 28 "	3.11	10.40	2.04
3rd 28 "	3.27	9.94	2.04
4th 28 "	3.09	9.50	1.92

Price realized on each ton cotton-seed meal, prices of other feeds being fixed, \$46.32.

Price realized on each ton cotton-seed hulls, prices of other feeds being fixed, \$13.24."

Bul. 147, Bureau of Animal Industry, U. S. Department of Agriculture, 1912; Fattening Calves in Alabama.

So-called Stock Food.

"It is not easy to regard the claims made by some manufacturers in a serious frame of mind. It does not seem as if any intelligent man would give them credence. It were quite as rational to expect that one sovereign remedy would build up a 'white man's hope' and at the same time control and cure rheumatism, ear-ache, and clergyman's sore throat, as to look for increased milk in cows, faster speed in horses, more eggs laid by hens, and for the cure of glanders in horses, abortion in cows and scours in calves, as a result of the use of one and the same powder. Somewhat less stress is laid by most manufacturers today on their food properties than formerly and more stress on their medicinal properties. Yet a typical advertisement in the March, 1912, number of a prominent agricultural paper, one which fills the entire back cover page and which lies before the writer as he writes, uses the catch words, 'Let me fatten 'em up,' and states that the goods which the advertisement vaunts 'doubles the milk and butter, when fed to milch cows . . . fattens hogs and beef cattle for market in 40 days' less time . . . as an egg maker . . . doubles the egg supply.'

Sometimes, however, an animal is slightly ailing, or is 'off feed,' hardly sick enough to necessitate a veterinarian's service. Under such circumstances stock foods or tonics may perhaps prove efficacious; but it is not essential that high priced proprietary condimental mixtures be used to remedy this situation. The feeder can buy the drugs at the drug store and formulate his own tonic, can save money by doing so, and can use definite quantities of definite materials rather than unknown proportions of a more or less mysterious, but usually diluted, mixture.

The Iowa station suggests this simple mixture, the preceding one being offered apparently largely for the purpose of matching up the medley of materials usually employed by manufacturers for this purpose:

"Powdered gentian	1 pound
Powdered ginger	1 pound
Fenugreek	5 pounds
Common salt	10 pounds
Bran	50 pounds
Oil meal	50 pounds"

—Bulletin No. 164, Vermont Agricultural Experiment Station, Burlington, Vt., March, 1912.



Standard bred mare Lucy Princeton with her foal by Chester Tine. Lucy Princeton has been fed cotton-seed meal and hulls for years, and in foaling this colt brought twins—both in perfect form.

Range Cattle Feeding

Daily Ration for Fattening Range Cattle.

- Cotton-seed meal 5 lbs.
- Sorghum hay, kaffir corn, or milo
maize 35 lbs.

The hay, kaffir corn stalk, or milo maize stalk should be dried, chopped and ground fine and then mixed with the cotton-seed meal.



A Modern Cotton-seed Oil Mill with Cattle
Pens and Feed Distribution Facilities in
Connection at Stamford, Texas.



Stamford Oil Mill.



Mill Buildings Showing Storage Bins for Mixed Feed.



Distributor Car Taking Load of Mixed Feed, Capacity
20,000 Lbs.



Showing Feed Distributing Car, Capacity 50,000 Lbs.
Per Hour.



Thoroughly satisfied cattle happily growing fat on Mixed Cotton-seed Meal and Hulls. The feeding period is from 75 to 100 days. During this time wild cattle direct from the range are converted into fat and sleek beeves, ready to "top" any market. Thousands of them go to all the markets of this and foreign countries every year, and prove, in their entire healthfulness and excellent condition the pre-eminent excellence of the feed. No other feed, either in time or cost, can accomplish anything like equal results.

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COTTON-SEED HULLS have more nutritive value than most common hay, which costs 50 per cent more, is more convenient to handle, is perfectly free from dust or foreign matter and is healthful and appetizing.

COTTON-SEED MEAL is the most concentrated and richest food known, has about six times the nutritive value of corn and more than four times that of Wheat Bran, while its cost is one and a half times that of either.

THE MIXED FEED forms a "Balanced Ration," giving better results, increased milk and butter production in Cows, and in Flesh, Fat and general condition in all animals, and for Cattle, Horses or Hogs, will reduce your feed bills and

**GIVES BETTER RESULTS THAN ANY
OTHER FEED IN THE WORLD.**

"Keep your money at home where you can get another chance at it. When you send your money away for feed it is gone for good. When you pay it out to the home mill for home products it is paid out again for home-grown seed or home labor, and we all get another whack at it, and some of it sticks every time."

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